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Chapter Author: Thomas J. Sargent

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The Ends of Four Big Inflations

Thomas J. Sargent

2.1 Introduction

Since the middle 1960s, many Western economies have experienced persistent and growing rates of inflation. Some prominent economists and statesmen have become convinced that this inflation has a stubborn, self-sustaining momentum and that either it simply is not susceptible to cure by conventional measures of monetary and fiscal restraint or, in terms of the consequent widespread and sustained unemployment, the cost of eradicating inflation by monetary and fiscal measures would be prohibitively high. It is often claimed that there is an underlying rate of inflation which responds slowly, if at all, to restrictive monetary and fiscal measures.¹ Evidently, this underlying rate of inflation is the rate of inflation that firms and workers have come to expect will prevail in the future. There is momentum in this process because firms and workers supposedly form their expectations by extrapolating past rates of inflation into the future. If this is true, the years from the middle 1960s to the early 1980s have left firms and workers with a legacy of high expected rates of inflation which promise to respond only slowly, if at all, to restrictive monetary and fiscal policy actions. According to this view, restrictive monetary and fiscal actions in the first instance cause substantial reduc-

Thomas J. Sargent is with the Federal Reserve Bank of Minneapolis and the Department of Economics, University of Minnesota.

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tions in output and employment but have little, if any, effects in reducing the rate of inflation. For the economy of the United States, a widely cited estimate is that for every one percentage point reduction in the annual inflation rate accomplished by restrictive monetary and fiscal measures, \$220 billion of annual GNP would be lost. For the \$2,500 billion United States economy, the cost of achieving zero percent inflation would be great, indeed, according to this estimate.

An alternative "rational expectations" view denies that there is any inherent momentum in the present process of inflation.² This view maintains that firms and workers have now come to expect high rates of inflation in the future and that they strike inflationary bargains in light of these expectations.³ However, it is held that people expect high rates of inflation in the future precisely because the government's current and prospective monetary and fiscal policies warrant those expectations. Further, the current rate of inflation and people's expectations about future rates of inflation may well seem to respond slowly to isolated *actions* of restrictive monetary and fiscal policy that are viewed as temporary departures from what is perceived as a long-term government *policy* involving high average rates of government deficits and monetary expansion in the future. Thus inflation only *seems* to have a momentum of its own; it is actually the long-term government policy of persistently running large deficits and creating money at high rates which imparts the momentum to the inflation rate. An implication of this view is that inflation can be stopped much more quickly than advocates of the "momentum" view have indicated and that their estimates of the length of time and the costs of stopping inflation in terms of foregone output (\$220 billion of GNP for one percentage point in the inflation rate) are erroneous. This is not to say that it would be easy to eradicate inflation. On the contrary, it would require far more than a few temporary restrictive fiscal and monetary actions. It would require a change in the policy *regime*: there must be an abrupt change in the continuing government *policy*, or *strategy*, for setting deficits now and in the future that is sufficiently binding as to be widely believed. Economists do not now possess reliable, empirically tried and true models that can enable them to predict precisely how rapidly and with what disruption in terms of lost output and employment such a regime change will work its effects. How costly such a move would be in terms of foregone output and how long it would be in taking effect would depend partly on how resolute and evident the government's commitment was.

This paper describes several dramatic historical experiences which I believe to be consistent with the "rational expectations" view but which seem difficult to reconcile with the "momentum" model of inflation. The idea is to stand back from our current predicament and to examine the measures that successfully brought drastic inflations under control in

several European countries in the 1920s. I shall describe and interpret events in Austria, Hungary, Germany, and Poland, countries which experienced a dramatic “hyperinflation” in which, after the passage of several months, price indexes assumed astronomical proportions. The basic data to be studied are the price indexes in figures 2.1–2.4. These data are recorded in a logarithmic scale, so that they will fit on a page. For all four countries, and especially Germany, the rise in the price level was spectacular. The graphs also reveal that in each case inflation stopped abruptly rather than gradually. I shall also briefly describe events in Czechoslovakia, a country surrounded by neighbors experiencing hyperinflations, but which successfully achieved a stable currency itself. My reason for studying these episodes is that they are laboratories for the study of regime changes. Within each of Austria, Hungary, Poland, and Germany, there occurred a dramatic change in the fiscal policy regime which in each instance was associated with the end of a hyperinflation. Further, though it shared some problems with its four neighbors, Czechoslovakia deliberately adopted a relatively restrictive fiscal policy regime, with the avowed aim of maintaining the value of its currency.

While there are many differences in details among the Austrian, Hungarian, Polish, and German hyperinflations, there are some very important common features. These include the following:

i) The nature of the fiscal policy regime in effect during each of the hyperinflations. Each of the four countries persistently ran enormous budget deficits on current account.

ii) The nature of the deliberate and drastic fiscal and monetary measures taken to end the hyperinflations.

iii) The immediacy with which the price level and foreign exchanges suddenly stabilized.⁴

iv) The rapid rise in the “high-powered” money supply in the months and years after the rapid inflation had ended.

I shall assemble and interpret the facts in the light of a view about the forces which give money value and about the way the international monetary system worked in the 1920s. Before interpreting the historical facts, I now turn to a brief description of this view.

2.2 The Gold Standard

After World War I, the United States was on the gold standard. The United States government stood ready to convert a dollar into a specified amount of gold on demand. To understatement, immediately after the war, Hungary, Austria, Poland, and Germany were not on the gold standard. In practice, their currencies were largely “fiat,” or unbacked. The governments of these countries resorted to the printing of new

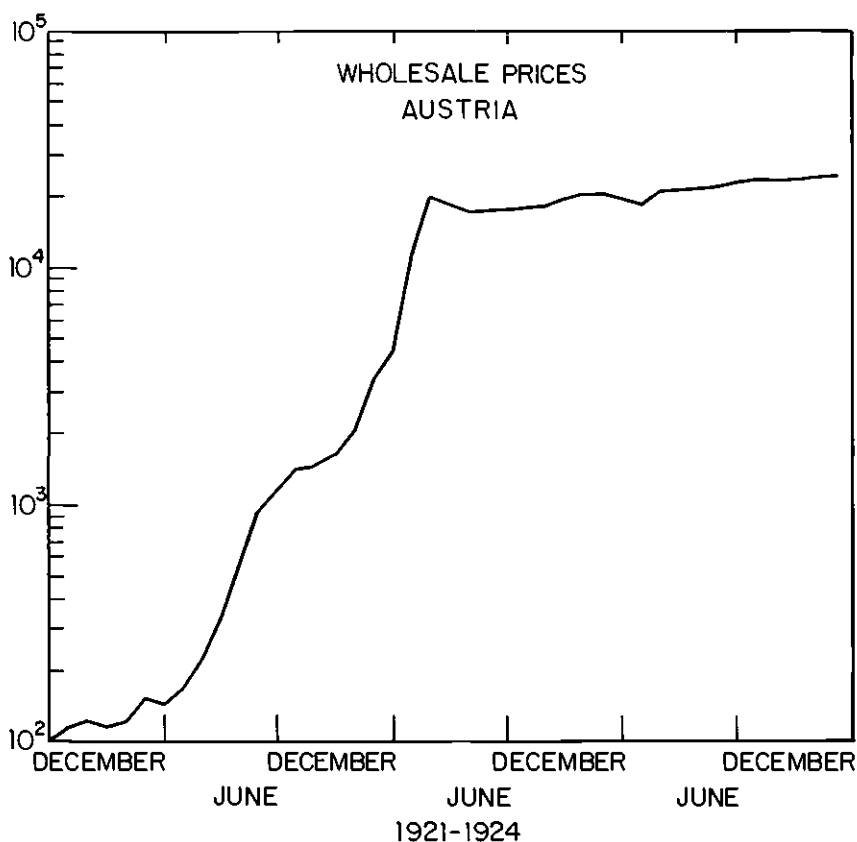


Fig. 2.1 Wholesale prices in Austria.

unbacked money to finance government deficits.⁵ This was done on such a scale that it led to a depreciation of the currencies of spectacular proportions. In the end, the German mark stabilized at 1 trillion (10^{12}) paper marks to the prewar gold mark, the Polish mark at 1.8 million paper marks to the gold zloty, the Austrian crown at 14,400 paper crowns to the prewar Austro-Hungarian crown, and the Hungarian krone at 14,500 paper crowns to the prewar Austro-Hungarian crown.⁶

This paper focuses on the deliberate changes in policy that each of Hungary, Austria, Poland, and Germany made to end its hyperinflation, and the deliberate choice of policy that Czechoslovakia made to avoid inflation in the first place. The hyperinflations were each ended by restoring or virtually restoring convertibility to the dollar or equivalently to gold. For this reason it is good to keep in mind the nature of the restrictions that adherence to the gold standard imposed on a government. Under the gold standard, a government issued demand notes and

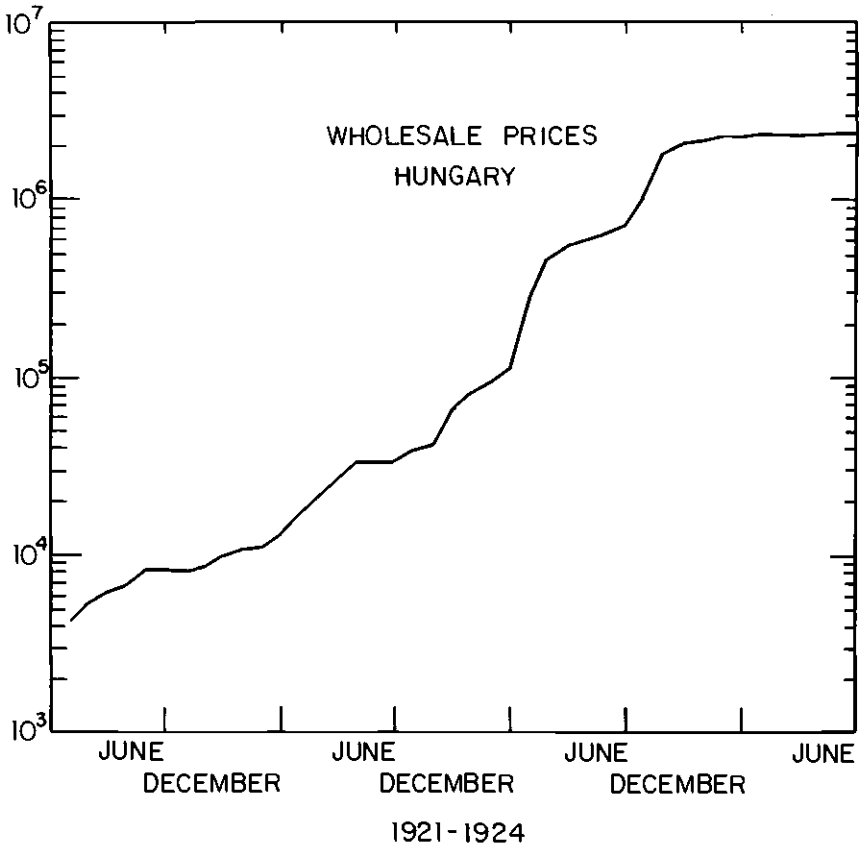


Fig. 2.2 Wholesale prices in Hungary.

longer-term debt which it promised to convert into gold under certain specified conditions, i.e. on demand, for notes. Presumably, people were willing to hold these claims at full value if the government's promise to pay were judged to be good. The government's promise to pay was "backed" only partially by its holding of gold reserves. More important in practice, since usually a government did not hold 100% reserves of gold, a government's notes and debts were backed by the commitment of the government to levy taxes in sufficient amounts, given its expenditures, to make good on its debt. In effect, the notes were backed by the government's pursuit of an appropriate budget policy. During the 1920s, John Maynard Keynes emphasized that the size of a government's gold reserve was not the determinant of whether it could successfully maintain convertibility with gold: its fiscal policy was.⁷ According to this view, what mattered was not the current government deficit but the present value of current and prospective future government deficits. The government was

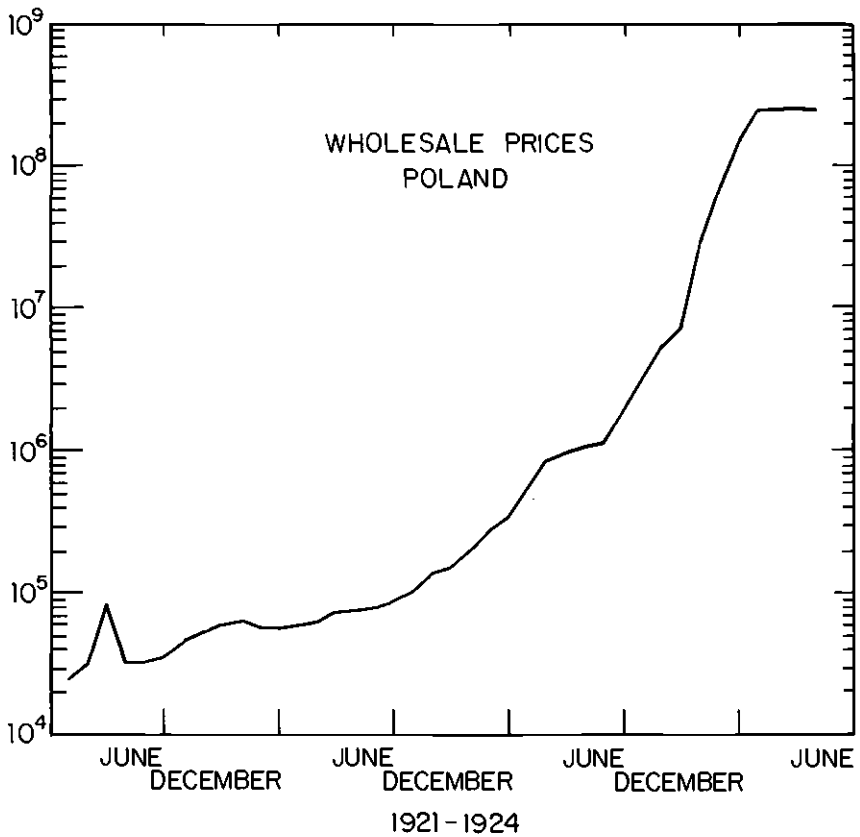


Fig. 2.3 Wholesale prices in Poland.

like a firm whose prospective receipts were its future tax collections. The value of the government's debt was, to a first approximation, equal to the present value of current and future government surpluses. So under a gold standard, a government must honor its debts and could not engage in inflationary finance. In order to assign a value to the government's debt, it was necessary to have a view about the fiscal policy regime in effect, that is, the rule determining the government deficit as a function of the state of the economy now and in the future. The public's perception of the fiscal regime influenced the value of government debt through private agents' expectations about the present value of the revenue streams backing that debt.⁸ It will be worthwhile to keep this view of the gold standard in mind as we turn to review the events surrounding the ends of the four hyperinflations.⁹

However, it will be useful first to expand a little more generally on the distinction between the effects of isolated *actions* taken within the context

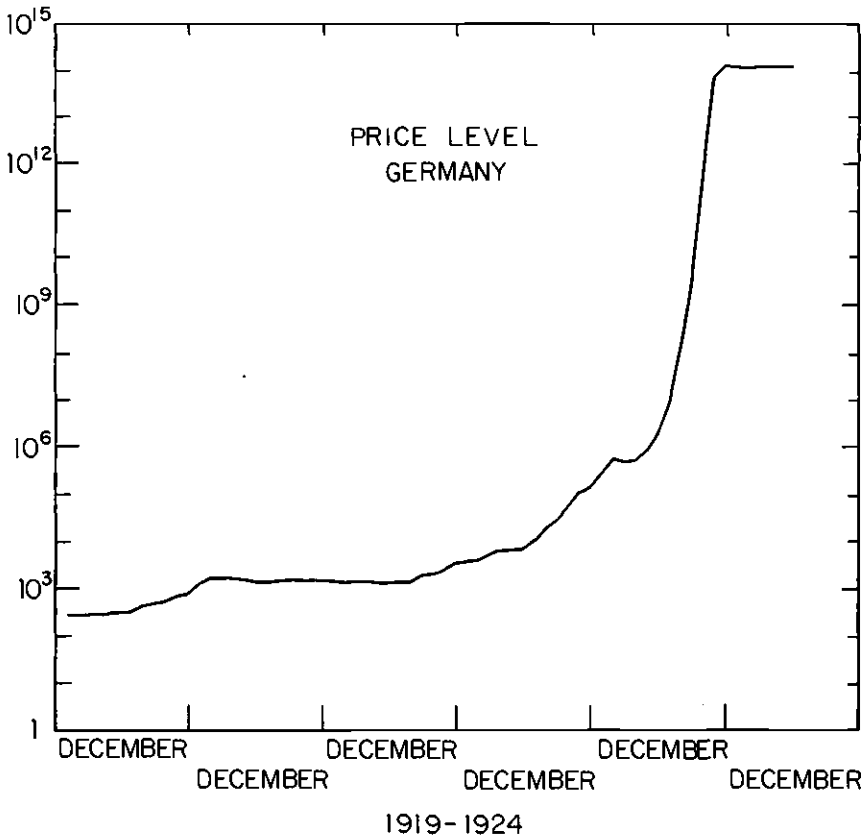


Fig. 2.4 Wholesale prices in Germany.

of a given general strategy, on the one hand, and the effects of choosing among alternative general strategies or rules for repeatedly taking actions, on the other. The latter choice I refer to as a choice of regime. The values of government expenditures and tax rates for one particular quarter are examples of actions, while the rules, implicit or explicit, for repeatedly selecting government expenditures and tax rates as functions of the state of the economy are examples of regimes. Recent work in dynamic macroeconomics has discovered the following general principle: whenever there is a change in the government strategy or regime, private economic agents can be expected to change their strategies or rules for choosing consumption rates, investment rates, portfolios, and so on.¹⁰ The reason is that private agents' behavior is selfish, or at least purposeful, so that when the government switches its strategy, private agents usually find it in their best interests to change theirs. One by-product of this principle is that most of the empirical relations captured in standard

econometric models cannot be expected to remain constant across contemplated changes in government policy regimes. For this reason, predictions made under the assumption that such relations will remain constant across regime changes ought not to be believed. The estimate that a 1% reduction in inflation would cost \$220 billion GNP annually is one example of such a faulty prediction. When an important change in regime occurs, dynamic macroeconomics would predict that the entire pattern of correlations among variables will change in quantitatively important ways.

While the distinction between isolated actions and strategy regimes is clear in principle, it is an admittedly delicate task to interpret whether particular historical episodes reflect isolated actions within the same old rules of the game or whether they reflect a new set of rules or government strategies.¹¹ All that we have to go on are the recorded actions actually taken, together with the pronouncements of public officials, laws, legislative votes, and sometimes constitutional provisions. Out of this material we are to fashion a view about the government strategy being used. Common sense suggests and technical econometric considerations confirm the difficulties in making such interpretations in general. Having said this, I believe that the examples discussed below are about as close to being laboratories for studying regime changes as history has provided.

2.3 Austria

At the end of World War I, the Austro-Hungarian empire dissolved into a number of successor states, of which Austria was one. From having been the center of an empire of 625,000 square kilometers and 50 million inhabitants, Austria was reduced to a mere 80,000 square kilometers and 6.5 million inhabitants. Having suffered food scarcities during the war that were produced by an effective Allied blockade, Austria found itself confronted with new national borders and trade barriers that cut it off from the food sources formerly within its empire. Further, the government of Austria reabsorbed a large number of Austrian imperial bureaucrats who were no longer welcome in the other successor states. Austrians also faced a large-scale unemployment problem stemming from the need to reconvert the economy to peaceful activities and to adjust to the new national borders. If this were not enough, as a loser of the war Austria owed the Reparation Commission sums that for a long time were uncertain in amount but were presumed eventually to be substantial. The Reparation Commission, in effect, held a blanket mortgage against the assets and revenues of the Austrian government.

Austria responded to these pressing problems by making large expenditures in the form of food relief and payments to the unemployed. In addition, the state railroads and monopolies ran deficits, as taxes and prices were kept relatively low. The government did not collect enough

taxes to cover expenditures and so ran very substantial deficits during the years 1919–22 (see table A1). As table A1 shows, in these years the deficit was typically over 50 percent of the total government expenditures. The government financed these deficits by selling treasury bills to the Austrian section of the Austro-Hungarian bank. The result was a very rapid increase in the volume of “high-powered” money, defined as the notes and demand deposit obligations of the central bank (see table A2). As the figures in table A2 indicate, between March 1919 and August 1922 the total note circulation in Austria¹² of the Austro-Hungarian bank increased by a factor of 288. This expansion of central bank notes stemmed mainly from the bank’s policy of discounting treasury bills. However, it also resulted partly from the central bank’s practice of making loans and discounts to private agents at nominal interest rates of between 6 and 9% per annum, rates which by any standard were far too low in view of the inflation rate, which averaged 10,000% per annum from January 1921 to August 1922 (table A3).¹³

In response to these government actions and what seemed like prospects for their indefinite continuation, the Austrian crown depreciated internationally and domestic prices rose rapidly (see tables A3 and A4). While between January 1921 and August 1922 the note circulation of the central bank increased by a factor of 39, the retail price index increased by a factor of 110 (see tables A3 and A4) so that the real value of the note circulation diminished during the currency depreciation.¹⁴ The “flight from the crown” occurred as people chose to hold less of their wealth in the form of the rapidly depreciating crown, attempting instead to hold foreign currencies or real assets.¹⁵ From the viewpoint of financing its deficit, the government of Austria had an interest in resisting the flight from the crown, because this had the effect of diminishing the resources that the government could command by printing money. Therefore the government established a system of exchange controls administered by an agency called the *Devisenzentrale*. The essential function of this

Table A1 **Austrian Budgets, 1919–22 (in millions of paper crowns)**

	Receipts	Expenditures	Deficit	Percentage of Expenditures Covered by New Issues of Paper Money
1 January–30 June 1919	1,339	4,043	2,704	67
1 July 1919–30 June 1920	6,295	16,873	10,578	63
1 July 1920–30 June 1921	29,483	70,601	41,118	58
1 January–31 December 1922	209,763	347,533	137,770	40

Source: Pasvolsky [25, p. 102].

Table A2 **Total Note Circulation of Austrian Crowns**
(in thousands of crowns)

1919	January	—	May	397,829,313	
	February	—	June	549,915,678	
	March	4,687,056	July	786,225,601	
	April	5,577,851	August	1,353,403,632	
	May	5,960,003	September	2,277,677,738	
	June	7,397,692	October	2,970,916,607	
	July	8,391,405	November	3,417,786,498	
	August	9,241,135	December	4,080,177,238	
	September	9,781,112	1923	January	4,110,551,163
	October	10,819,310		February	4,207,991,722
	November	11,193,670	March	4,459,117,216	
	December	12,134,474	April	4,577,382,333	
1920	January	13,266,878	May	4,837,042,081	
	February	14,292,809	June	5,432,619,312	
	March	15,457,749	July	5,684,133,721	
	April	15,523,832	August	5,894,786,367	
	May	15,793,805	September	6,225,109,352	
	June	16,971,344	October	6,607,839,105	
	July	18,721,495	November	6,577,616,341	
	August	20,050,281	December	7,125,755,190	
	September	22,271,686	1924	January	6,735,109,000
	October	25,120,385		February	7,364,441,000
	November	28,072,331	March	7,144,901,000	
	December	30,645,658	April	7,135,471,000	
1921	January	34,525,634	May	7,552,620,000	
	February	38,352,648	June	7,774,958,000	
	March	41,067,299	July	7,995,647,000	
	April	45,036,723	August	5,894,786,367	
	May	45,583,194	September	7,998,509,000	
	June	49,685,140	October	8,213,003,000	
	July	54,107,281	November	8,072,021,000	
	August	58,533,766	December	8,387,767,000	
	September	70,170,798	1925	January	7,902,217,000
1922	January	227,015,925		February	7,957,242,000
	February	259,931,138	March	7,897,792,000	
	March	304,063,642	April	7,976,420,000	
	April	346,697,776			

Source: Young [36, vol. 2, p. 292].

agency was to increase the amount of Austrian crowns held by Austrians, which it accomplished by adopting measures making it difficult or illegal for Austrians to hold foreign currencies and other substitutes for Austrian crowns.¹⁶ Despite these regulations, it is certain that Austrian citizens were holding large amounts of foreign currencies during 1921 and 1922.

Table A4 reveals that the Austrian crown abruptly stabilized in August 1922, while table A3 indicates that prices abruptly stabilized a month

Table A3 Austrian Retail Prices, 1921-24

		Retail Price Index, 52 Commodities
1921	January	100
	February	114
	March	122
	April	116
	May	121
	June	150
	July	143
	August	167
	September	215
	October	333
	November	566
	December	942
1922	January	1,142
	February	1,428
	March	1,457
	April	1,619
	May	2,028
	June	3,431
	July	4,830
	August	11,046
	September	20,090
	October	18,567
	November	17,681
	December	17,409
1923	January	17,526
	February	17,851
	March	18,205
	April	19,428
	May	20,450
	June	20,482
	July	19,368
	August	18,511
	September	20,955
	October	21,166
	November	21,479
	December	21,849
1924	January	22,941
	February	23,336
	March	23,336
	April	23,361
	May	23,797
	June	24,267

Source: Young [36, vol. 2, p. 293].

Table A4 Exchange Rates, Austrian Crowns
per United States Dollar, in New York Market

	1919	1920	1921	1922	1923	1924
January	17.09	271.43	654.00	7,375.00	71,500.00	70,760.00
February	20.72	250.00	722.50	6,350.00	71,150.00	70,760.00
March	25.85	206.66	676.00	7,487.50	71,000.00	70,760.00
April	26.03	200.00	661.00	7,937.50	70,850.00	70,760.00
May	24.75	155.83	604.00	11,100.00	70,800.00	70,760.00
June	29.63	145.00	720.00	18,900.00	70,800.00	70,760.00
July	37.24	165.00	957.00	42,350.00	70,760.00	70,760.00
August	42.50	237.14	1,081.50	77,300.00	70,760.00	70,760.00
September	68.50	255.00	2,520.00	74,210.00	70,760.00	70,760.00
October	99.50	358.33	4,355.00	73,550.00	70,760.00	70,760.00
November	130.00	493.66	8,520.00	71,400.00	70,760.00	70,760.00
December	155.00	659.40	5,275.00	70,925.00	70,760.00	70,760.00

Source: Young [36, vol. 2, p. 294].

later. This occurred despite the fact that the central bank's note circulation continued to increase rapidly, as table A1 indicates. Furthermore, there occurred no change in currency units or "currency reform," at least not for another year and a half.

The depreciation of the Austrian crown was suddenly stopped by the intervention of the Council of the League of Nations and the resulting binding commitment of the government of Austria to reorder Austrian fiscal and monetary strategies dramatically. After Austria's increasingly desperate pleas to the Allied governments for international aid had repeatedly been rejected or only partially fulfilled, in late August 1922 the Council of the League of Nations undertook to enter into serious negotiations to reconstruct the financial system of Austria. These negotiations led to the signing of three protocols on 2 October 1922 which successfully guided the financial reconstruction of Austria. It is remarkable that even before the precise details of the protocols were publicly announced, the fact of the serious deliberations of the Council brought relief to the situation. This can be seen in tables A3 and A4, and was described by Pasvolsky as follows:

The moment the Council of the League decided to take up in earnest the question of Austrian reconstruction, there was immediately a widespread conviction that the solution of the problem was at hand. This conviction communicated itself first of all to that delicately adjusted mechanism, the international exchange market. Nearly two weeks before Chancellor Seipel officially laid the Austrian question before the Council of the League, on August 25, the foreign exchange rate ceased to soar and began to decline, the internal price level following suit three weeks later. The printing presses in Austria were

still grinding out new currency; the various ministries were still dispersing this new currency through the country by means of continuing budgetary deficits. Yet the rate of exchange was slowly declining. The crisis was checked.¹⁷

The first protocol was a declaration signed by Great Britain, France, Italy, Czechoslovakia, and Austria that reaffirmed the political independence and sovereignty of Austria.¹⁸ The second protocol provided conditions for an international loan of 650 million gold crowns to Austria. The third protocol was signed by Austria alone and laid out a plan for reconstruction of its fiscal and monetary affairs. The Austrian government promised to establish a new independent central bank, to cease running large deficits, and to bind itself not to finance deficits with advances of notes from the central bank. Further, the government of Austria agreed to accept in Austria a commissioner general, appointed by the Council of the League, who was to be responsible for monitoring the fulfillment of Austria's commitments. The government of Austria also agreed to furnish security to back the reconstruction loan. At the same time, it was understood that the Reparation Commission would give up or modify its claim on the resources of the government of Austria.

The government of Austria and the League both moved swiftly to execute the plan outlined in the protocols. In legislation of 14 November 1922, the Austrian National Bank was formed to replace the old Austrian section of the Austro-Hungarian bank; it was to take over the assets and functions of the Devisenzentrale. The new bank began operations on 1 January 1923 and was specifically forbidden from lending to the government except on the security of an equal amount of gold and foreign assets. The bank was also required to cover its note issues with certain minimal proportions of gold, foreign earning assets, and commercial bills. Further, once the government's debt to the bank had been reduced to 30 million gold crowns, the bank was obligated to resume convertibility into gold.

The government moved to balance its budget by taking concrete steps in several directions. Expenditures were reduced by discharging thousands of government employees. Under the reconstruction scheme, the government promised gradually to discharge a total of 100,000 state employees. Deficits in government enterprises were reduced by raising prices of government-sold goods and services. New taxes and more efficient means of collecting tax and custom revenues were instituted. The results of these measures can be seen by comparing the figures in table A5 with those in table A1. Within two years the government was able to balance the budget.

The stabilization of the Austrian crown was not achieved via a currency reform. At the end of 1924 a new unit of currency was introduced, the schilling, equal to 10,000 paper crowns. The introduction of this new unit

Table A5 The Austrian Budget, 1923-25 (in millions of schillings)

Item	Closed Accounts		
	1923	1924	1925
Total revenue	697.4	900.6	908.5
Current expenditures	779.6	810.0	741.4
Deficit (-) or surplus (+)	-82.2	+90.6	+167.1
Capital expenditures	76.0	103.6	90.6
Total balance	-158.2	-13.0	+76.5

Source: Pasvolsky [25, p. 127].

Note: 1 schilling = 10,000 paper crowns.

of currency occurred long after the exchange rate had been stabilized and was surely an incidental measure.¹⁹

Table A2 reveals that from August 1922, when the exchange rate suddenly stabilized, to December 1924, the circulating notes of the Austrian central bank increased by a factor of over 6. The phenomenon of the achievement of price stability in the face of a sixfold increase in the stock of "high-powered" money was widely regarded by contemporaries as violating the quantity theory of money, and so it seems to do. However, these observations are not at all paradoxical when interpreted in the light of a view which distinguishes sharply between unbacked, or "outside," money, on the one hand, and backed, or "inside," money, on the other hand. In particular, the balance sheet of the central bank and the nature of its open market operations changed dramatically after the carrying out of the League's protocols, with the consequence that the proper interpretation of the figures on the total note obligations of the central bank changes substantially. Before the protocols, the liabilities of the central bank were backed mainly by government treasury bills; that is, they were not backed at all, since treasury bills signified no commitment to raise revenues through future tax collections. After the execution of the protocols, the liabilities of the central bank became backed by gold, foreign assets, and commercial paper, and ultimately by the power of the government to collect taxes. At the margin, central bank liabilities were backed 100% by gold, foreign assets, and commercial paper as notes and the deposits were created through open market operations in those assets (see table A6). The value of the crown was backed by the commitment of the government to run a fiscal policy compatible with maintaining the convertibility of its liabilities into dollars. Given such a fiscal regime, to a first approximation, the intermediating activities of the central bank did not affect the value of the crown so long as the assets purchased by the bank were sufficiently valuable. Thus the sixfold increase in the liabilities of the central bank after the protocols ought not to be regarded as inflationary. The willingness of Austrians to convert

Table A6 Austrian National Bank Balance Sheet
(end of month, in millions of crowns)

	Gold	Foreign Exchange and Currency	Loans and Discounts	Treasury Bills	Notes in Circulation	Deposits
1923:						
January	49,304	1,058,244	731,046	2,556,848	4,110,551	279,092
February	83,438	1,029,134	728,884	2,552,682	4,207,992	178,752
March	86,097	1,336,385	821,397	2,550,159	4,459,117	329,109
April	73,270	1,439,999	741,858	2,550,159	4,577,382	226,273
May	73,391	1,682,209	875,942	2,550,159	4,837,042	343,339
June	73,391	2,532,316	730,848	2,547,212	5,432,619	362,237
July	73,391	2,947,216	658,966	2,539,777	5,684,134	535,121
August	73,391	3,050,085	647,936	2,538,719	5,894,786	413,383
September	73,391	3,126,599	863,317	2,537,661	6,225,109	373,673
October	62,117	3,356,232	1,069,340	2,536,604	6,607,839	414,882
November	62,117	3,504,652	1,094,620	2,535,547	6,577,616	617,321
December	83,177	3,832,132	1,325,380	2,534,490	7,125,755	649,424
1924:						
January	91,274	3,811,148	1,253,110	2,533,434	6,735,109	536,982
February	105,536	3,921,594	1,737,334	2,532,379	7,364,441	558,800
March	106,663	3,953,872	1,733,400	2,295,428	7,144,901	752,814
April	107,059	3,669,333	2,131,984	2,294,471	7,315,471	696,141
May	107,443	3,344,337	2,660,449	2,259,839	7,554,620	641,001
June	107,762	3,178,339	3,092,470	2,237,794	7,774,958	741,400
July	108,342	3,254,477	3,304,876	2,231,173	7,995,647	896,032
August	108,256	3,453,177	3,226,962	2,219,459	8,002,142	997,677
September	108,950	3,724,916	2,852,688	2,210,527	7,998,509	890,537
October	109,327	4,032,485	2,379,700	2,202,106	8,213,003	502,579
November	110,643	4,312,355	1,945,627	2,196,181	8,072,021	484,750
December	110,890	4,770,548	1,881,593	2,178,185	8,387,767	533,450
1925:						
January	111,314	3,337,911	1,545,295	2,172,491	7,902,217	438,390
February	111,474	3,310,032	1,285,158	2,150,151	7,957,242	315,771
March	111,649	3,202,802	1,047,719	2,107,949	7,897,792	295,498
April	112,168	3,474,672	1,059,069	2,088,777	7,976,420	236,957

Source: Young [36, vol. 2, p. 291].

hoards of foreign exchange into crowns which is reflected in table A6 is not surprising since the stabilization of the crown made it a much more desirable asset to hold relative to foreign exchange.²⁰

The available figures on unemployment indicate that the stabilization of the crown was attended by a substantial increase in the unemployment rate, though unemployment had begun to climb well before stabilization was achieved (see table A7). The number of recipients of state unemploy-

Table A7 Number of Austrian Unemployed in Receipt of Relief (in thousands)

Beginning of	1922	1923	1924	1925	1926
January	17	117	98	154	208
April	42	153	107	176	202
July	33	93	64	118	151
October	38	79	78	119	148

Source: League of Nations [14, p. 87].

ment benefits gradually climbed from a low of 8,700 in December 1921 to 83,000 in December 1922. It climbed to 167,000 by March 1923, and then receded to 76,000 in November 1923.²¹ How much of this unemployment was due to the achievement of currency stabilization and how much was due to the real dislocations affecting the Austrian economy cannot be determined. However, it is true that currency stabilization was achieved in Austria very suddenly, and with a cost in increased unemployment and foregone output that was minor compared with the \$220 billion GNP that some current analysts estimate would be lost in the United States per one percentage point inflation reduction.

2.4 Hungary

Like its old partner in the Hapsburg monarchy, Hungary emerged from World War I as a country much reduced in land, population, and power. It retained only 25% of its territory (down from 325,000 square kilometers to 92,000) and only 37% of its population (down from 21 million to about 8 million). Its financial and economic life was disrupted by the newly drawn national borders separating it from peoples and economic institutions formerly within the domain of the Hapsburg monarchy.

At the end of the war, Hungary experienced political turmoil as the Hapsburg King Charles was replaced by the government of Prince Karolyi. In March 1919, the Karolyi government was overthrown by the Bolsheviks under Bela Kun. The regime of Bela Kun lasted only four months, as Romania invaded Hungary, occupied it for a few weeks, and then withdrew. A new repressive right wing regime under Admiral Horthy then took power. The "white terror" against leftists carried out by supporters of Horthy took even more lives than the "red terror" that had occurred under Bela Kun.

At the end of the war, the currency of Hungary consisted of the notes of the Austro-Hungarian bank. By the provisions of the peace treaties of Trianon and St. Germain, the successor states to the Austro-Hungarian empire were required to stamp the notes of the Austro-Hungarian bank that were held by their residents, in effect, thereby recognizing those

notes as debts of the respective new states. Before Hungary executed this provision of the Treaty of Trianon, the currency situation grew more complicated, for the Bolshevik regime had access to the plates for printing one- and two-crown Austro-Hungarian bank notes and it used them to print more notes. The Bolshevik government also issued new so-called white notes. Each of these Bolshevik-issued currencies was honored by the subsequent government.

The Austro-Hungarian bank was liquidated at the end of 1919, and it was replaced by an Austrian section and a Hungarian section. The functions of the Hungarian section of the old bank were assumed in August 1921 by a State Note Institute, which was under the control of the minister of finance. In August 1921, the Note Institute issued its own notes, the Hungarian krone, in exchange for Hungarian stamped notes of the Austro-Hungarian bank and several other classes of notes, including those that had been issued by the Bolshevik regime.

As a loser of the war, Hungary owed reparations according to the Treaty of Trianon. The Reparation Commission had a lien on the resources of the government of Hungary. However, neither the total amount owed nor a schedule of payments was fixed for many years after the war. This circumstance alone created serious obstacles in terms of achieving a stable value for Hungary's currency and other debts, since the unclear reparations obligations made uncertain the nature of the resources which backed those debts.

From 1919 until 1924 the government of Hungary ran substantial budget deficits. The government's budget estimates in table H1 are reported by Pasvolsky substantially to understate the size of the deficits.²² These deficits were financed by borrowing from the State Note Institute, and were a major cause of a rapid increase in the note and deposit liabilities of the institute. An additional cause of the increase in liabilities of the institute was the increasing volume of loans and discounts that it made to private agents (see table H2). These loans were made at a very

Table H1 **Hungarian Budget Estimates, 1920-24**
(in millions of paper crowns)

	Revenue	Expenditures	Deficit	Percentage of Expenditures Covered by Issues of Paper Money
1920-21	10,520	20,210	9,690	47.9
1921-22	20,296	26,764	6,468	24.1
1922-23	152,802	193,455	40,653	21.0
1923-24	2,168,140	3,307,099	1,138,959	34.4

Source: Pasvolsky [25, p. 299].

Table H2 Balance Sheet of Hungarian Central Bank or State Note Institute (millions of kronen)

	Gold Coin and Bullion	Silver Coin	Foreign Currency and Exchange	Bills Dis- counted	Advances on Securities	Advances to Treasury	Notes in Circu- lation	Current Accounts and Deposits
1921:								
January	—	—	—	10,924	195	—	15,206	3,851
February	—	—	—	13,202	162	—	15,571	5,531
March	—	—	—	12,862	160	—	15,650	5,246
April	—	—	—	12,178	110	—	13,114	6,802
May	—	—	—	11,847	111	—	13,686	5,760
June	—	—	—	11,693	108	—	18,096	1,162
July	—	—	—	11,787	107	—	15,799	3,532
August	4	1	—	17,799	1,199	—	17,326	2,975
September	5	1	—	20,994	1,194	—	20,845	2,407
October	12	1	—	22,403	1,185	900	23,643	2,154
November	12	1	—	23,650	1,176	1,000	24,742	2,353
December	12	1	—	23,859	1,158	900	25,175	2,240
1922:								
January	13	1	—	24,195	1,147	1,300	25,680	2,488
February	13	1	—	23,952	1,504	1,900	26,758	2,354
March	13	1	—	24,574	1,565	3,000	29,327	2,224
April	13	1	—	25,120	1,565	4,100	30,580	2,901
May	13	1	—	25,326	1,560	5,500	31,930	3,289
June	13	1	—	25,445	1,556	6,900	33,600	3,741
July	13	1	—	28,783	1,546	7,200	38,357	3,929
August	13	1	—	37,617	1,773	7,600	46,242	5,417
September	14	1	—	46,963	1,848	8,900	58,458	5,929

October	14	1	—	51,631	1,728	12,000	70,005	5,189
November	15	1	—	49,246	1,861	12,500	72,016	6,408
December	16	1	—	50,702	2,016	16,500	75,887	4,761
1923:								
January	14	1	—	54,516	2,007	20,000	73,717	5,888
February	23	1	—	58,358	2,013	24,000	75,135	6,600
March	23	1	—	71,284	2,584	29,000	82,205	11,152
April	23	1	—	83,800	2,817	37,000	100,101	9,793
May	23	1	—	93,396	1,763	47,200	119,285	10,609
June	23	1	—	120,608	2,490	59,700	154,996	12,742
July	22	1	—	165,927	1,762	79,700	226,285	21,977
August	22	1	—	273,605	1,789	143,000	399,487	23,629
September	22	1	—	380,454	1,776	243,000	588,810	60,246
October	23	1	—	494,501	1,663	269,000	744,926	60,176
November	23	1	—	531,403	1,047	306,000	853,989	74,970
December	23	1	—	582,117	935	401,000	931,337	84,791
1924:								
January	24	1	—	654,294	9,346	526,000	1,084,677	105,481
February	23	1	—	746,471	34,023	699,000	1,278,437	164,838
March	24	1	—	802,756	4,598	824,000	1,606,875	253,935
April	24	1	—	1,125,898	12,456	944,000	2,098,091	308,121
May	24	1	—	1,420,385	13,437	1,054,000	2,486,257	527,137
June ¹	246,947	9,823	681,268	1,192,517	17,566	1,980,000	2,893,719	1,135,710
July	441,832	13,545	1,110,926	1,257,597	—	1,980,000	3,277,943	1,424,578
August	449,945	13,558	1,382,885	1,438,454	—	1,978,130	3,659,757	1,473,231
September	540,425	13,560	1,385,880	1,756,636	—	1,977,306	4,115,925	1,416,400
October	503,377	13,301	1,658,674	1,872,385	—	1,976,455	4,635,090	1,465,356
November	508,411	13,301	1,816,102	1,984,540	—	1,975,631	4,442,644	1,929,754
December	532,842	13,299	1,933,356	1,976,888	—	1,974,781	4,513,990	2,069,468

Table H2 (continued)

	Gold Coin and Bullion	Silver Coin	Foreign Currency and Exchange	Bills Dis- counted	Advances on Securities	Advances to Treasury	Notes in Circu- lation	Current Accounts and Deposits
1925:								
January	509,848	12,373	1,967,314	1,848,620	—	1,973,930	4,449,650	2,138,629
February	596,334	12,374	1,989,096	1,676,594	—	1,973,163	4,237,985	2,542,262
March	669,107	12,374	1,984,006	1,514,532	—	1,969,809	4,270,096	2,552,762
April	653,534	12,136	2,081,998	1,485,898	—	1,968,987	4,526,216	2,470,507

Source: Young [36, vol. 2, p. 321].

Note: Figures prior to June 1924 are those of the State Note Institute. The Hungarian National Bank opened 24 June 1924 and took over the affairs of the institute.

¹After this date gold and silver holdings are shown in terms of paper crowns. Other changes were also made in the presentation of accounts after the opening of the new Hungarian National Bank in June.

low interest rate, in view of the rapid rate of price appreciation, and to a large extent amounted to simple gifts from the Note Institute to those lucky enough to receive loans on such generous terms. These private loans account for a much larger increase in high-powered money in the Hungarian than in the other three hyperinflations we shall study.

As table H3 shows, the Hungarian krone depreciated rapidly on foreign exchange markets, and domestic prices rose rapidly. Between January 1922 and April 1924, the price index increased by a factor of 263. In the same period, the total notes and deposit liabilities of the Note Institute increased by a factor of 85, so that the real value of its liabilities decreased substantially. As in the case of Austria, this decrease was symptomatic of a "flight from the krone," as residents of Hungary attempted to economize on their holdings of kronas and instead to hold assets denominated in more stable currencies. As in the case of Austria, the government of Hungary resisted this trend by establishing in August 1922 a Hungarian Devisenzentrale within the State Note Institute.

Table H3 indicates that in March 1924, the rise in prices and the depreciation of the krone internationally both abruptly halted. The stabilization occurred in the face of continued expansion in the liabilities of the central bank, which increased by a factor of 3.15 between March 1924 and January 1925 (see table H2). This pattern parallels what occurred in Austria and has a similar explanation.

As in Austria, the financial reconstruction of Hungary was accomplished with the intervention of the League of Nations. Together with the Reparation Commission and the government of Hungary, the League devised a plan which reduced and clarified the reparations commitment of Hungary, arranged for an international loan that would help finance government expenditures, and committed Hungary to establish a balanced budget and a central bank legally bound to refuse any government demand for unbacked credit. On 21 February 1924, the Reparation Commission agreed to give up its lien on Hungary's resources so that these could be used to secure a reconstruction loan. A variety of Western nations also agreed to give up their liens on Hungary so that the new loan could successfully be floated.

The League's reconstruction plan was embodied in two protocols. The first was signed by Great Britain, France, Italy, Czechoslovakia, Rumania, and Hungary, and guaranteed the "political independence, territorial integrity, and sovereignty of Hungary." The second protocol outlined the terms of the reconstruction plan, and committed Hungary to balance its budget and form a central bank truly independent of the Finance Ministry. The government was also obligated to accept in Hungary a commissioner general, responsible to the League, to monitor and supervise the government's fulfillment of its commitment to fiscal and monetary reform.

Table H3 Hungarian Price and Exchange Rate

	Hungarian Index of Prices ¹	Cents per Crown in New York
1921:		
July	4,200	0.3323
August	5,400	.2629
September	6,250	.1944
October	6,750	.1432
November	8,300	.1078
December	8,250	.1512
1922:		
January	8,100	.1525
February	8,500	.1497
March	9,900	.1256
April	10,750	.1258
May	11,000	.1261
June	12,900	.1079
July	17,400	.0760
August	21,400	.0595
September	26,600	.0423
October	32,900	.0402
November	32,600	.0413
December	33,400	.0430
1923:		
January	38,500	.0392
February	41,800	.0395
March	66,000	.0289
April	83,500	.0217
May	94,000	.0191
June	144,500	.0140
July	286,000	.0097
August	462,500	.0056
September	554,000	.0055
October	587,000	.0054
November	635,000	.0054
December	714,000	.0052
1924:		
January	1,026,000	.0039
February	1,839,100	.0033
March	2,076,700	.0015
April	2,134,600	.0014
May	2,269,600	.0012
June	2,207,800	.0011
July	2,294,500	.0012
August	2,242,000	.0013
September	2,236,600	.0013

Table H3 (continued)

	Hungarian Index of Prices ¹	Cents per Crown in New York
October	2,285,200	.0013
November	2,309,500	.0013
December	2,346,600	.0013
1925:		
January	2,307,500	.0014
February	2,218,700	.0014
March	2,117,800	.0014

Source: Young [36, vol. 2, p. 323].

¹From July 1921 through November 1923, the index numbers represent retail prices and are based on 60 commodities with July 1914 = 100. From December 1923 through March 1925, the figures are based on wholesale prices computed by the Hungarian Central Statistical Office. They refer to the prices of 52 commodities on the last day of the month with 1913 = 100.

A reconstruction loan of 250 million gold kronen was successfully placed abroad in July 1924. The loan was secured by receipts from customs duties and sugar taxes, and revenues from the salt and tobacco monopolies. The purpose of the loan was to give the government a concrete means of converting future promises to tax into current resources while avoiding the need to place its debt domestically.

By a law of 26 April 1924, the Hungarian National Bank was established, and it began operations on 24 June. The bank assumed the assets and liabilities of the State Note Institute and took over the functions of the foreign exchange control office, the *Devisenzentrale*. The bank was prohibited from making any additional loans or advances to the government, except upon full security of gold or foreign bills. The bank was also required to hold gold reserves of certain specified percentages behind its liabilities.

The government of Hungary also tried to establish a balanced budget. Both by cutting expenditures and raising tax collections, the government was successful in moving quickly to a balanced budget (see table H4). Indeed, the proceeds of the reconstruction loan were used perceptibly more slowly than had been anticipated in the reconstruction plan.

As table H2 confirms, the stabilization of the krone was accompanied by a substantial *increase* in the total liabilities of the central bank. But as with Austria, the drastic shift in the fiscal policy regime that occasioned the stabilization also changed the appropriate interpretation of these figures. As table H2 indicates and as the regulations governing the bank required, after the League's intervention the note and deposit liabilities

Table H4 Hungarian Budget, 1924-25 (in millions of crowns)

Period	Preliminary Treasury Accounts			Reconstruction Scheme		
	Re-ceipts	Expen-ditures	Surplus (+) or Deficit (-)	Re-ceipts	Expen-ditures	Surplus (+) or Deficit (-)
Jul.-Dec. 1924	208.0	205.9	+ 2.1	143.8	186.3	- 42.5
Jan.-Jun. 1925	245.1	216.9	+ 28.2	150.0	207.6	- 57.6
Fiscal year 1924-25	453.1	422.8	+ 30.3	293.8	393.9	- 100.1

Source: Pasvolksy [25, p. 322].

of the central bank became backed, 100% at the margin, by holdings of gold, foreign exchange, and commercial paper. In effect, the central bank's liabilities represented "fiat money" before the League's plan was in effect; after that plan was in effect, they represented more or less backed claims on British sterling,²³ the foreign currency to which Hungary pegged its exchange as a condition for British participation in the reconstruction loan.

Figures on unemployment in Hungary are reported in table H5, and unfortunately begin only immediately after the price stabilization had already occurred. All that can be inferred from these figures is that immediately after the stabilization, unemployment was not any higher than it was one or two years later. This is consistent either with the hypothesis that the stabilization process had little adverse effect on

Table H5 Number of Unemployed in Hungary (figures relate only to members of Union of Socialist Workers, in thousands of workers)

End of	1924	1925	1926
January	—	37	28
February	—	37	29
March	—	37	29
April	22	36	26
May	23	30	28
June	25	34	26
July	31	32	
August	30	27	
September	20	25	
October	30	23	
November	31	26	
December	33	27	

Source: League of Nations [15, p. 50].

unemployment or with the hypothesis that the adverse effect was so long-lasting that no recovery occurred within the time span of the figures recorded. The former hypothesis seems more plausible to me.

2.5 Poland

The new nation of Poland came into existence at the end of World War I, and was formed from territories formerly belonging to Germany, Austro-Hungary, and Russia. At the time of its formation, Poland possessed a varied currency consisting of Russian rubles, crowns of the Austro-Hungarian bank, German marks, and Polish marks issued by the Polish State Loan Bank, which had been established by Germany to control the currency in the part of Poland occupied by Germany during the war. For Poland, the armistice of 1918 did not bring peace, a costly war with Soviet Russia being waged until the fall of 1920. Poland was devastated by the fighting and by Germany's practice of stripping it of its machinery and materials during World War I.²⁴

The new government of Poland ran very large deficits up to 1924 (see table P1). These deficits were financed by government borrowing from the Polish State Loan Bank, which the new government had taken over from the Germans. From January 1922 to December 1923, the outstanding notes of the Polish State Loan Bureau increased by a factor of 523 (table P2). Over the same period, the price index increased by a factor of

Table P1 Polish Receipts and Expenditures (in thousands of zloty)

	1921	1922	1923	1924	1925
Receipts:					
Administration	261,676	467,979	—	—	1,491,743
State Enterprises	11,413	14,556	—	—	133,530
Monopolies	72,222	47,893	—	—	356,611
Total	345,311	530,428	426,000	1,703,000	1,981,884
Expenditures:					
Administration	765,263	734,310	—	—	1,830,231
State Enterprises	115,589	145,003	—	—	106,343
Monopolies	—	—	—	—	45,019
Total	880,852	879,313	1,119,800	1,629,000	1,981,593
Deficit	535,541	348,885	692,000	—	—
Surplus	—	—	—	74,000	251

Source: Young [36, vol. 2, p. 183].

Note: Conversion from marks to zloty was made on the following basis: 1921, 1 zloty = 303.75 marks. First quarter 1922, 1 zloty = 513.52 marks; second quarter, 691.49 marks; third quarter, 1,024.97 marks; and fourth quarter, 1,933.87 marks.

Table P2 Balance Sheet of Bank of Poland, 1918-25 (end of month figures)

Month	Gold ¹	Silver ¹ (in- cluding base coin)	Balances with Foreign Banks	Dis- counts	Advances		Note Circula- tion
					Com- mercial	Govern- ment	
Polish State Loan Bank figures (prior to May 1924) in millions of marks							
1918:							
October	—	—	—	7.0	180.8	—	880.2
November	—	—	—	7.0	184.0	13.9	930.5
December	—	—	—	6.4	183.7	117.8	1,023.8
1919:							
January	—	—	—	5.0	194.7	209.9	1,098.1
February	—	—	—	4.2	196.4	315.0	1,160.0
March	3.7	4.2	3.9	3.5	189.7	400.0	1,223.2
April	3.7	4.4	9.4	2.5	192.8	575.0	1,346.0
May	3.7	8.9	5.8	1.8	193.2	925.0	1,548.3
June	4.9	14.8	14.6	1.3	185.9	1,125.0	1,784.6
July	5.7	20.1	13.3	1.1	193.9	1,925.0	2,087.9
August	6.1	20.5	20.3	.7	107.4	2,525.0	2,466.6
September	6.3	21.6	69.8	.1	218.9	3,225.0	2,964.7
October	6.5	24.3	91.0	.3	242.4	4,375.0	3,723.6
November	6.6	24.6	151.6	3.4	270.2	5,375.0	4,236.2
December	6.6	25.5	344.6	3.9	243.8	6,825.0	5,316.3

1920:

January	6.6	25.5	244.1	3.7	278.5	8,275.0	6,719.9
February	6.8	25.9	565.7	6.4	303.0	10,775.0	8,300.3
March	6.8	25.9	685.4	8.2	319.1	14,775.0	10,690.6
April	6.8	25.9	685.5	14.8	316.7	19,375.0	16,027.9
May	6.8	25.9	565.7	47.2	320.9	22,375.0	17,934.7
June	6.8	25.9	894.7	161.4	488.2	27,625.0	21,730.1
July	6.8	25.9	1,130.9	325.9	847.5	33,375.0	26,311.4
August	9.0	33.8	1,273.4	465.8	1,466.1	39,625.0	31,085.8
September	9.1	34.1	174.9	333.9	1,862.9	40,625.0	33,203.5
October	9.5	34.4	236.7	259.1	2,527.0	46,925.0	38,456.8
November	10.1	35.4	203.8	396.0	3,278.4	49,625.0	43,236.2
December	12.4	37.6	80.7	611.6	3,999.2	59,625.0	43,236.2
December	12.4	37.6	80.7	611.6	3,999.2	59,625.0	49,361.5

1921:

January	12.7	39.2	205.8	1,040.2	4,100.2	65,625.0	55,079.5
February	12.8	39.2	476.0	955.1	4,143.5	77,125.0	62,560.4
March	13.1	39.8	908.5	781.0	4,745.7	93,625.0	74,087.4
April	13.4	40.3	870.7	927.0	4,994.4	106,625.0	86,755.3
May	13.5	40.1	536.5	1,395.2	4,979.0	117,625.0	94,575.8
June	14.3	41.1	49.36	1,557.3	5,306.5	130,625.0	102,697.3
July	19.1	41.5	601.3	2,504.2	6,291.5	140,625.0	115,242.3
August	19.2	42.0	368.7	3,885.4	7,776.9	158,000.0	133,734.2
September	19.4	42.5	1,217.5	6,237.3	9,878.6	178,000.0	152,792.1
October	20.2	42.9	2,341.3	9,529.5	12,022.3	198,500.0	182,777.3
November	22.6	43.5	7,040.1	14,347.2	15,144.3	214,000.0	207,029.0
December	24.9	43.9	12,707.9	15,324.4	19,300.0	221,000.0	229,537.6

Table P2 (continued)

Month	Gold ¹	Silver ¹ (in- cluding base coin)	Balances with Foreign Banks	Dis- counts	Advances		Note Circula- tion
					Com- mercial	Govern- ment	
1922:							
January	26.3	44.2	13,614.2	15,951.6	21,776.9	227,350.0	239,615.3
February	28.3	44.4	14,207.7	19,555.0	22,327.7	230,600.0	247,209.5
March	29.0	44.7	1,156.4	25,451.1	25,473.3	232,100.0	250,665.5
April	29.5	45.2	7,388.0	28,688.8	29,063.7	220,000.0	260,553.8
May	30.1	45.3	23,073.4	34,555.0	26,067.0	217,000.0	276,001.1
June	30.9	45.3	20,521.4	46,629.8	24,499.5	235,000.0	300,101.1
July	31.5	45.4	21,741.0	47,661.2	24,054.4	260,000.0	335,426.6
August	31.6	45.4	51,747.2	56,366.6	21,079.9	285,000.0	385,787.5
September	32.4	45.4	67,384.1	64,093.0	22,239.4	342,000.0	463,706.0
October	33.5	45.4	64,060.9	81,781.9	26,576.5	453,500.0	579,972.7
November	33.8	45.4	78,959.0	107,320.1	41,278.1	519,500.0	661,092.4
December	41.0	45.4	48,580.4	133,400.8	47,904.1	675,600.0	793,437.5
1923:							
January	41.1	44.1	34,721.8	174,950.1	51,899.9	799,500.0	909,160.3
February	41.4	44.1	71,883.7	219,610.7	61,037.1	1,085,000.0	1,177,300.8
March	41.7	44.2	29,868.7	274,657.8	85,323.2	1,752,000.0	1,841,205.6
April	41.9	44.2	50,851.9	304,725.4	156,815.4	2,161,500.0	2,332,396.8
May	41.9	44.3	43,900.7	449,440.7	217,162.3	2,377,000.0	2,733,794.1
June	43.9	39.8	276,506.3	627,339.5	310,862.7	2,996,500.0	3,566,649.1
July	46.9	34.8	384,375.1	758,112.8	390,850.9	4,190,500.0	4,478,709.0
August	48.0	32.9	340,354.4	1,372,150.9	637,268.2	6,473,000.0	6,871,776.5

September	53.2	20.7	857,084.5	2,077,128.6	670,019.6	10,265,500.0	11,197,737.8
October	54.2	19.1	1,510,794.3	3,540,434.4	1,836,712.7	19,080,500.0	23,080,402.2
November	54.3	19.5	6,499,791.5	8,467,033.7	3,951,781.9	42,854,000.0	53,217,494.6
December	54.9	19.6	57,499,741.7	20,588,037.9	28,065,396.8	111,332,000.0	125,371,955.3
1924:							
January	66.2	19.8	91,533,085.2	43,916,802.8	54,181,445.2	238,200,000.0	313,659,830.0
February	66.7	19.8	172,626,128.8	67,216,289.7	83,829,440.5	291,700,000.0	528,913,418.7
March	68.0	20.3	220,658,210.7	138,649,934.8	81,231,988.5	291,700,000.0	596,244,205.6
April	55.7	21.1	277,340,925.7	199,248,956.4	60,589,081.0	291,700,000.0	570,697,550.5

After conversion of State Loan Bank into Bank of Poland, figures in gold zlotys; no ciphers omitted; 1 zloty = 19.3 cents

May	11,684,963 ²	214,191,336	126,522,906	1,801,936	—	—	244,977,010
June	83,392,914 ²	256,972,386	138,862,243	5,826,971	—	—	334,405,730
July	93,683,430 ²	272,137,898	166,713,469	8,236,693	—	—	394,262,550
August	98,288,324 ²	266,390,583	199,710,736	8,224,610	—	—	430,263,045
September	99,900,015 ²	233,646,562	233,788,177	9,230,850	—	—	460,383,770
October	100,686,634	16,521,223	241,894,738	245,054,984	12,374,342	—	503,701,830
November	102,809,285	21,951,828	247,034,974	249,560,999	12,371,166	—	497,600,470
December	103,362,870	27,543,698	269,045,551	256,954,853	23,897,766	—	550,873,960
1925:							
January	104,249,258	27,658,749	242,115,258	270,423,615	23,468,829	—	553,174,980
February	107,032,735	27,481,871	206,317,320	286,229,180	28,467,930	18,222,212	549,637,420
March	116,619,825	28,158,597	259,392,902	306,562,690	25,477,638	403,354	563,171,945
April	117,428,697	28,358,000	216,114,621	294,632,508	27,319,944	35,977,630	567,178,830

Source: Young [36, vol. 2, p. 348].

¹Gold at par; silver coin at face value.

²Gold and silver.

2,402 while the dollar exchange rate decreased by a factor of 1,397 (see tables P3 and P4). As in the other inflations we have studied, the real value of the note circulation decreased as people engaged in a "flight from the mark." Extensive government exchange controls were imposed to resist this trend.

Tables P2 and P3 indicate that the rapid inflation and exchange depreciation both suddenly stopped in January 1924. Unlike the cases of Austria and Hungary, in Poland the initial stabilization was achieved without foreign loans or intervention, although later in 1927, after currency depreciation threatened to renew, a substantial foreign loan was arranged.²⁵ But in terms of the substantial fiscal and monetary regime changes that accompanied the end of the inflation, there is much similarity to the Austrian and Hungarian experiences. The two interrelated

Table P3 Polish Index Numbers of Wholesale Prices, 1921-25

Year	Month	Wholesale Price Index ¹	Year	Month	Wholesale Price Index ¹	
1921	January	25,139	1923	April	1,058,920	
	February	31,827		May	1,125,350	
	March	32,882		June	1,881,410	
	April	31,710		July	3,069,970	
	May	32,639		August	5,294,680	
	June	35,392		September	7,302,200	
	July	45,654		October	27,380,680	
	August	53,100		November	67,943,700	
	September	60,203		December	142,300,700	
	October	65,539		1924	January	242,167,700
	November	58,583			February	248,429,600
	December	57,046			March	245,277,900
1922	January	59,231	April		242,321,800	
	February	63,445	May			
	March	73,465	June			
	April	75,106	July			
	May	78,634	August			
	June	87,694	September			
	July	101,587	October			
	August	135,786	November			
	September	152,365	December			
	October	201,326	1925	January		
	November	275,647		February		
	December	346,353		March		
1923	January	544,690		April		
	February	859,110		May		
	March	988,500				

Source: Young [36, vol. 2, p. 349].

¹1914 = 100.

Table P4 Polish Exchange Rates, 1919-25

Year	Month	Cents per Polish Mark	Year	Month	Cents per Polish Mark	
1919	July	6.88	1922	September	.0127	
	August	5.63		October	.0095	
	September	3.88		November	.0065	
	October	3.08		December	.0057	
	November	1.88	1923	January	.0043	
	December	1.29		February	.0025	
1920	January	.70		March	.0024	
	February	.68		April	.0023	
	March	.67		May	.0021	
	April	.60		June	.0013	
	May	.51		July	.0007	
	June	.59		August	.0004	
	July	.61		September	.00035	
	August	.47		October	.0001113	
	September	.45		November	.000502	
	October	.37		December	.0000234	
	November	.26	1924	January	.0000116	
	December	.16		February	.0000109	
1921	January	.145		March	.0000113	
	February	.130		April	.0000114	
	March	.132		May	—	
	April	.130	Cents per Zloty			
	May	.124	June	10.29		
	June	.082	July	19.25		
	July	.0516	August	19.23		
	August	.0489	September	19.22		
	September	.0256	October	19.22		
	October	.0212	November	19.21		
	November	.0290	December	19.20		
	December	.0313	1925	January	19.18	
	1922	January		.0327	February	19.18
		February		.0286	March	19.18
		March		.0236	April	19.18
		April		.0262	May	19.18
		May		.0249	June	19.18
		June	.0237			
July		.0185				
August		0.0135				

Source: Young [36, vol. 2, p. 350].

changes were a dramatic move toward a balanced government budget and the establishment of an independent central bank that was prohibited from making additional unsecured loans to the government. In January 1924, the minister of finance was granted broad powers to effect mone-

tary and fiscal reform. The minister immediately initiated the establishment of the Bank of Poland, which was to assume the functions of the Polish State Loan Bank. The eventual goal was to restore convertibility with gold. The bank was required to hold a 30% reserve behind its notes, to consist of gold and foreign paper assets denominated in stable currencies. Beyond this reserve, the bank's notes had to be secured by private bills of exchange and silver. A maximum credit to the government of 50 million zlotys was permitted. The government also moved swiftly to balance the budget (see table P1).

In January 1924, a new currency unit became effective, the gold zloty, worth 1.8 million paper marks. The zloty was equal in gold content to 19.29 cents.

Table P2 reveals that, from January 1924 to December 1924, the note circulation of the central bank increased by a factor of 3.2, in the face of relative stability of the price level and the exchange rate (see tables P3 and P4). This phenomenon matches what occurred in Austria and Hun-

Table P5 **Polish Unemployed**

1921:		1923:	
January	74,000	January	81,184
February	90,000	February	106,729
March	80,000	March	114,576
April	88,000	April	112,755
May	130,000	May	93,731
June	115,000	June	76,397
July	95,000	July	64,563
August	65,000	August	56,515
September	70,000	September	—
October	78,000	October	—
November	120,000	November	—
December	173,000	December	67,581
1922:		1924:	
January	221,444	January	100,580
February	206,442	February	110,737
March	170,125	March	112,583
April	148,625	April	109,000
May	128,916	May	84,000
June	98,581	June	97,870
July	85,240	July	149,097
August	69,692	August	159,820
September	68,000	September	155,245
October	61,000	October	147,065
November	62,000	November	150,180
December	75,000	December	159,060

Source: *Statistisches Jahrbuch für das Deutsche Reich* [33].

gary and has a similar explanation. As table P2 reveals, the increased note circulation during this period was effectively backed 100% by gold, foreign exchange, and private paper.

The available figures on unemployment are summarized in table P5. The stabilization of the price level in January 1924 is accompanied by an abrupt rise in the number of unemployed. Another rise occurs in July of 1924. While the figures indicate substantial unemployment in late 1924, unemployment is not an order of magnitude worse than before the stabilization, and certainly not anywhere nearly as bad as would be predicted by application of the same method of analysis that was used to fabricate the prediction for the contemporary United States that each percentage point reduction in inflation would require a reduction of \$220 billion in real GNP.

The Polish zloty depreciated internationally from late 1925 onward but stabilized in autumn of 1926 at around 72% of its level of January 1924. At the same time, the domestic price level stabilized at about 50% above its level of January 1924. The threatened renewal of inflation has been attributed to the government's premature relaxation of exchange controls and the tendency of the central bank to make private loans at insufficient interest rates.²⁶

2.6 Germany

After World War I, Germany owed staggering reparations to the Allied countries. This fact dominated Germany's public finance from 1919 until 1923 and was a most important force for hyperinflation.

At the conclusion of the war, Germany experienced a political revolution and established a republican government. The early postwar governments were dominated by moderate Socialists, who for a variety of reasons reached accommodations with centers of military and industrial power of the prewar regime.²⁷ These accommodations in effect undermined the willingness and capability of the government to meet its admittedly staggering revenue needs through explicit taxation.

Of the four episodes that we have studied, Germany's hyperinflation was the most spectacular, as the figures on wholesale prices and exchange rates in tables G1 and G2 reveal. The inflation became most severe after the military occupation of the Ruhr by the French in January 1923. The German government was determined to fight the French occupation by a policy of passive resistance, making direct payments to striking workers which were financed by discounting treasury bills with the Reichsbank.

Table G3 estimates the budget of Germany for 1920 to 1923.²⁸ The table reveals that, except for 1923, the budget would not have been badly out of balance except for the massive reparations payments made. The disruption caused to Germany's finances by the reparations situation is

Table G1 German Wholesale Prices, 1914-24

Year	Month	Price Index	Year	Month	Price Index
1914	January	96	1918	January	204
	February	96		February	198
	March	96		March	198
	April	95		April	204
	May	97		May	203
	June	99		June	209
	July	99		July	208
	August	109		August	235
	September	111		September	230
	October	118		October	234
	November	123		November	234
	December	125		December	245
1915	January	126	1919	January	262
	February	133		February	270
	March	139		March	274
	April	142		April	286
	May	139		May	297
	June	139		June	308
	July	150		July	339
	August	146		August	422
	September	145		September	493
	October	147		October	562
	November	147		November	678
	December	148		December	803
1916	January	150	1920	January	1,260
	February	151		February	1,690
	March	148		March	1,710
	April	149		April	1,570
	May	151		May	1,510
	June	152		June	1,380
	July	161		July	1,370
	August	159		August	1,450
	September	154		September	1,500
	October	153		October	1,470
	November	151		November	1,510
	December	151		December	1,440
1917	January	156	1921	January	1,440
	February	158		February	1,380
	March	159		March	1,340
	April	163		April	1,330
	May	163		May	1,310
	June	165		June	1,370
	July	172		July	1,430
	August	203		August	1,920
	September	199		September	2,070
	October	201		October	2,460
	November	203		November	3,420
	December	203		December	3,490

Table G1 (continued)

Year	Month	Price Index	Year	Month	Price Index	
1922	January	3,670	1923	July	7,478,700	
	February	4,100		August	94,404,100	
	March	5,430		September	2,394,889,300	
	April	6,360		October	709,480,000,000	
	May	6,460		November	72,570,000,000,000	
	June	7,030		December	126,160,000,000,000	
	July	10,160		1924	January	117,320,000,000,000
	August	19,200			February	116,170,000,000,000
	September	28,700			March	120,670,000,000,000
	October	56,600			April	124,050,000,000,000
	November	115,100			May	122,460,000,000,000
	December	147,480			June	115,900,000,000,000
1923	January	278,500	July	115 ¹		
	February	588,500	August	120 ¹		
	March	488,800	September	127 ¹		
	April	521,200	October	131 ¹		
	May	817,000	November	129 ¹		
	June	1,938,500	December	131 ¹		

Source: Young [36, vol. 1, p. 530].

¹On basis of prices in reichsmarks. (1 reichsmark = 1 trillion [10¹²] former marks.)

surely understated by the reparations figures given in table G3. For one thing, considerably larger sums were initially expected of Germany than it ever was eventually able to pay. For another thing, the extent of Germany's total obligation and the required schedule of payments was for a long time uncertain and under negotiation. From the viewpoint that the value of a state's currency and other debt depends intimately on the fiscal policy it intends to run, the uncertainty about the reparations owed by the German government necessarily cast a long shadow over its prospects for a stable currency.

As table G4 reveals, the note circulation of the Reichsbank increased dramatically from 1921 to 1923, especially in the several months before November 1923. As pointed out by Young [36], at the end of October 1923, over 99% of outstanding Reichsbank notes had been placed in circulation within the previous 30 days.²⁹ Table G4 reveals the extent to which the Reichsbank note circulation was backed by discounted treasury bills. During 1923, the Reichsbank also began discounting large volumes of commercial bills. Since these loans were made at nominal rates of interest far below the rate of inflation, they amounted virtually to government transfer payments to the recipients of the loans.

Especially during the great inflation of 1923, a force came into play which was also present in the other hyperinflations we have studied.

Table G2 German Exchange Rates, 1914-25

Year	Month	Cents per Mark	Year	Month	Cents per Mark	
1920	January	1.69	1922	August	.10	
	February	1.05		September	.07	
	March	1.26		October	.03	
	April	1.67		November	.01	
	May	2.19		December	.01	
	June	2.56		1923	January	.007
	July	2.53			February	.004
	August	2.10			March	.005
	September	1.72			April	.004
	October	1.48			May	.002
	November	1.32			June	.001
	December	1.37			July	.000,3
1921	January	1.60	August		.000,033,9	
	February	1.64	September		.000,001,88	
	March	1.60	October		.000,000,068	
	April	1.57	November		.000,000,000,043	
	May	1.63	December		.000,000,000,022,7	
	June	1.44	1924	January	22.6	
	July	1.30		February	21.8	
	August	1.19		March	22.0	
	September	.96		April	22.0	
	October	.68		May	22.3	
	November	.39		June	23.4	
	December	.53		July	23.9	
1922	January	.52		August	23.8	
	February	.48		September	23.8	
	March	.36		October	23.8	
	April	.35		November	23.8	
	May	.34		December	23.8	
	June	.32	1925 ¹	January	23.8	
	July	.20				

Source: Young [36, vol. 1, p. 532].

¹Cents per rentenmark and (after October 1924) per reichsmark. 1 rentenmark is equivalent to 1 reichsmark or 1 billion former paper marks. The reichsmark is the equivalent of the gold mark worth 23.82 cents.

Table G3 Real German Revenues and Expenditures, Calculated on the Basis of the Cost-of-Living Index (in millions of gold marks)

	Revenue			Expenditures					Total
	Taxes	Sun-dries	Deficit Covered by Loan Transactions	Repayment of Floating Debt	Interest on Floating Debt	Subsidies to Railroads	Execution of Versailles Treaty	Sun-dries	
1920-21	4,090.8	132.9	7,041.9	821.7	—	—	—	—	11,265.6
1921-22	5,235.7	100.5	6,627.4	1,039.5	811.6	1,114.4	5,110.6	5,738.4	11,963.4
1922-23	3,529.1	51.4	6,384.5	81.0	344.4	1,685.5	3,600.0	4,254.1	9,965.0
1923-24 (first 9 months)	1,496.1	180.6	11,836.5	—	931.0	3,725.0	—	—	13,513.2

Source: Young [36, vol. 2, p. 393].

Table G4

Balance Sheet of German Reichsbank, 1914-24

	Discounted Bills				Total	Advances	Securities
	Treasury Bills	Com- mercial Bills	Discounted				
			Treasury and Commercial Bills				
1921:							
January	50,594,540	2,742,406	53,336,946	8,881	147,126		
February	53,690,412	2,760,927	56,451,339	11,522	185,788		
March	64,533,894	2,268,745	66,802,639	2,805	217,044		
April	58,841,630	2,052,099	60,803,729	9,238	225,777		
May	62,953,604	1,809,936	64,763,540	16,624	258,664		
June	79,607,790	1,565,406	81,172,196	6,079	282,716		
July	79,981,967	1,135,529	81,117,496	10,686	283,381		
August	84,043,891	1,002,497	85,046,388	7,704	258,319		
September	98,422,137	1,142,218	99,564,355	3,289	277,977		
October	98,704,768	881,474	99,586,242	47,775	282,179		
November	114,023,417	1,445,667	115,469,084	90,370	247,699		
December	132,380,906	1,061,754	133,392,660	8,476	195,912		
1922:							
January	126,160,402	1,592,416	127,752,818	20,548	198,725		
February	134,251,808	1,856,936	136,108,744	62,305	215,362		
March	146,531,247	2,151,677	148,682,924	20,688	205,936		
April	155,617,524	2,403,044	158,020,568	134,314	229,242		
May	167,793,922	3,376,599	171,170,521	54,361	199,314		
June	186,125,747	4,751,748	190,877,495	58,994	307,564		
July	207,858,232	8,122,066	215,980,298	141,276	313,488		
August	249,765,773	21,704,341	271,470,114	172,966	241,162		
September	349,169,650	50,234,414	400,004,064	61,516	416,193		

October	477,201,494	101,155,267	578,356,761	624,368	502,348
November	672,222,197	246,948,596	919,170,793	51,425,030 ¹	381,068
December	1,184,464,359	422,235,296	1,606,699,655	773,974	469,972
1923:					
January	1,609,081,121	697,216,424	2,306,297,545	95,316,552	483,318
February	2,947,363,994	1,829,341,080	4,776,705,074	27,422,282	1,209,935
March	4,552,011,661	2,372,101,757	6,924,113,418	2,132,906	1,690,011
April	6,224,899,348	2,986,116,724	9,211,016,072	20,466,948	1,207,105
May	8,021,904,840	4,014,693,720	12,036,598,560	61,030,322	697,611
June	18,338 ²	6,914,198,630	25,252,198,630	188,548,574	344,819
July	53,752 ²	18,314 ²	72,066 ²	2,553,177,597	1,422,291
August	987,219 ²	164,644 ²	1,151,863 ²	25,261 ²	15,539,853
September	45,216,224 ²	3,660,094 ²	48,876,318 ²	98,522 ²	1,801,579,570
October	6,578,650,939 ²	1,058,129,855 ²	7,636,780,794 ²	41,787,532 ²	9,536,953 ²
15 November	189,801,468,187 ²	39,529,577,254 ²	229,331,045,441 ²	535,714,637 ²	8,901,495 ²
30 November	96,874,330,250 ²	347,301,037,776 ²	444,175,368,026 ²	7,742,665,263 ²	336,495,629 ²
December	(3)	322,724,948,986 ²	322,724,948,986 ²	268,325,819,530 ²	65,791,385 ²
1924: ⁴					
January	—	—	755,866	336,520	12
February	—	—	1,165,649	306,618	25
March	—	—	1,767,443	143,102	533
April	—	—	1,916,969	156,362	91,984
May	—	—	1,954,930	128,597	80,011
June	—	—	1,897,959	108,789	76,378
July	—	—	1,798,097	62,489	76,509
August	—	—	1,860,843	59,983	76,331
September	—	—	2,169,684	54,424	78,305
15 October ⁵	—	—	2,153,943	15,947	77,517
31 October	—	—	2,339,616	33,443	77,699
November	—	—	2,290,166	18,628	77,808
December	—	—	2,064,094	16,960	77,999

(Footnotes appear on p. 82)

Table G4 (continued)

	Notes in Circulation	Demand Deposits			Due to the bank
		Public	Other	Total Demand Deposits	
1921:					
January	66,620,804	4,055,904	11,778,060	15,833,964	
February	67,426,959	7,291,052	10,066,036	17,357,088	
March	69,417,228	15,206,381	12,836,292	28,042,673	
April	70,839,725	11,595,618	9,260,271	20,855,889	
May	71,838,866	3,548,492	10,545,201	14,093,693	
June	75,321,095	5,647,805	14,744,903	20,392,708	
July	77,390,853	4,810,026	11,014,130	15,824,156	
August	80,072,721	4,850,843	8,798,756	13,649,599	
September	86,384,286	4,618,087	15,362,208	19,980,295	
October	91,527,679	5,239,628	13,063,035	18,302,663	
November	100,943,632	5,144,615	20,168,499	25,313,114	
December	113,639,464	7,591,343	25,314,330	32,905,673	
1922:					
January	115,375,766	5,286,950	18,125,502	23,421,452	
February	120,026,387	5,806,922	20,719,150	26,526,072	
March	130,671,352	7,743,735	25,614,597	33,358,332	
April	140,420,057	7,577,862	24,038,306	31,616,168	
May	151,949,179	7,711,279	25,416,711	33,127,990	
June	169,211,792	10,125,837	27,047,908	37,173,745	
July	189,794,722	9,197,727	30,778,489	39,976,216	
August	238,147,160	13,708,213	42,416,241	56,124,454	
September	316,869,799	30,034,309	79,978,068	110,012,377	

October	469,456,818	34,270,926	106,508,333	140,779,259
November	754,086,109	50,353,945	190,615,514	240,969,459
December	1,280,094,831	153,190,991	377,335,296	530,526,287
1923:				
January	1,984,496,369	157,058,537	605,205,692	763,264,229
February	3,512,787,777	253,915,266	1,329,065,770	1,582,981,036
March	5,517,919,651	368,550,293	1,903,533,291	2,272,083,584
April	6,545,984,355	454,403,079	3,399,871,714	3,854,274,793
May	8,563,749,470	652,575,366	4,410,494,865	5,063,070,231
June	17,291 ²	1,648,114,327	8,304,602,339	9,952,716,666
July	43,595 ²	3,779,235,298	24,078 ²	27,857 ²
August	663,200 ²	206,168 ²	384,912 ²	591,080 ²
September	28,228,815 ²	8,186,467 ²	8,781,150 ²	16,966,617 ²
October	2,496,822,909 ²	606,660,673 ²	3,261,424,030 ²	3,868,085,703 ²
15 November	92,844,720,743 ²	72,457,230,513 ²	57,095,366,904 ²	129,552,597,417 ²
30 November	400,267,640,302 ²	120,478,936,906 ²	253,497,803,653 ²	373,976,740,559 ²
December	496,507,424,772 ²	303,114,560,004 ²	244,906,637,001 ²	548,024,197,005 ²
1924: ⁴				
January	483,675	492,985	281,320	281,305
February	587,875	367,551	282,958	650,509
March	689,864	352,360	352,334	704,694
April	776,949	474,411	330,561	804,972
May	926,874	545,252	259,203	804,455
June	1,097,309	493,043	280,884	773,927
July	1,211,038	452,597	290,390	742,987
August	1,391,895	264,064	297,791	561,855
September	1,520,511	307,515	362,581	670,096
15 October ⁵	1,396,748	—	—	828,511
31 October	1,780,930	—	—	708,728
November	1,863,200	—	—	703,938
December	1,941,440	—	—	820,865
				456,508

(Footnotes appear on p. 82)

Given the method of assessing taxes in nominal terms, lags between the time when taxes were levied and the time when they were collected led to reduced revenues as the government evidently repeatedly underestimated the prospective rate of inflation and as the rapid inflation gave people a large incentive to delay paying their taxes. This effect probably partially accounts for the reduced tax revenues collected during the first nine months of 1923. The French occupation of the Ruhr also helps explain it.

In response to the inflationary public finance and despite the efforts of the government to impose exchange controls, there occurred a "flight from the German mark" in which the real value of Reichsmark notes decreased dramatically. The figures in table G1 indicate that between January 1922 and July 1923, wholesale prices increased by a factor of 2,038 while Reichsbank notes increased by a factor of 378. Between January 1922 and August 1923, wholesale prices increased by a factor of 25,723 while Reichsbank notes circulating increased by a factor of 5,748. The fact that prices increased proportionately many times more than did the Reichsbank note circulation is symptomatic of the efforts of Germans to economize on their holdings of rapidly depreciating German marks. Toward the end of the hyperinflation, Germans made every effort to avoid holding marks and held large quantities of foreign exchange for purposes of conducting transaction. By October 1923, it has been roughly estimated, the real value of foreign currencies circulating in Germany was at least equal to and perhaps several times the real value of Reichsbank notes circulating.³⁰

The figures in tables G1 and G2 show that prices suddenly stopped rising and the mark stopped depreciating in late November 1923. The event of stabilization was attended by a "monetary reform," in which on 15 October 1923 a new currency unit called the Rentenmark was declared equivalent to 1 trillion (10^{12}) paper marks. While great psychological

Footnotes to Table G4

Source: Young [36, vol. 1, pp. 528–29].

Note: End of month figures, in thousands of current marks; from January 1924 in thousands of rentenmarks or reichsmarks. 1 rentenmark is equivalent to 1 reichsmark or 1 trillion (10^{12}) former paper marks. The reichsmark is the equivalent of the gold mark worth 23.82 cents.

¹The large increase of advances at the close of November 1922 occurred because the Reichsbank had to take over temporarily the financing of food supplies from the loan bureaus (Darlehenskassen), as the latter were unable to extend the needed accommodation, their outstanding notes having reached the maximum amount permitted by law.

²In billions.

³A decree of 15 November 1923 discontinued the discounting of treasury bills by the Reichsbank.

⁴See note above.

⁵Date of first statement of reorganized Reichsbank.

significance has sometimes been assigned to this unit change, it is difficult to attribute any substantial effects to what was in itself only a cosmetic measure.³¹ The substantive aspect of the decree of 15 October was the establishing of a Rentenbank to take over the note issue functions of the Reichbank. The decree put binding limits upon both the total volume of Rentenmarks that could be issued, 3.2 billion marks, and the maximum amount that could be issued to the government, 1.2 billion marks. This limitation on the amount of credit that could be extended to the government was announced at a time when the government was financing virtually 100% of its expenditures by means of note issue.³² In December 1923, the management of the Rentenbank was tested by the government and effectively made clear its intent to meet its obligation to limit government borrowing to within the amount decreed.

Simultaneously and abruptly three things happened: additional government borrowing from the central bank stopped, the government budget swung into balance, and inflation stopped. Table G5 shows the dramatic progress toward a balanced budget that was made in the months after the Rentenbank decree.

The government moved to balance the budget by taking a series of deliberate, permanent actions to raise taxes and eliminate expenditures.

Table G5 Ordinary Revenues and Expenditures of the German Federal Government (from *Wirtschaft und Statistik*, issued by the Statistisches Reichsamt, in millions of gold marks)

	Ordinary Revenue		Ordinary Expenditures	Excess of Revenue (+) or Expenditure (-)
	Total	Of Which Taxes Yielded		
1923:				
November	68.1	63.2	—	—
December	333.9	312.3	668.7	-334.8
1924:				
January	520.6	503.5	396.5	+124.1
February	445.0	418.0	462.8	-17.8
March	632.4	595.3	498.6	133.8
April	579.5	523.8	523.5	+56.0
May	566.7	518.7	459.1	+107.6
June	529.7	472.3	504.5	+25.2
July	622.2	583.1	535.1	+86.9
August	618.2	592.0	597.6	+20.6
September	665.6	609.2	581.6	+84.0
October	714.3	686.7	693.0	+21.3

Source: Young [36, vol. 1, p. 422].

Young reports that "by the personnel decree of October 27, 1923, the number of government employees was cut by 25 percent; all temporary employees were to be discharged; all above the age of 65 years were to be retired. An additional 10 percent of the civil servants were to be discharged by January 1924. The railways, overstaffed as a result of post-war demobilization, discharged 120,000 men during 1923 and 60,000 more during 1924. The postal administration reduced its staff by 65,000 men; the Reichsbank itself which had increased the number of its employees from 13,316 at the close of 1922 to 22,909 at the close of 1923, began the discharge of its superfluous force in December, as soon as the effects of stabilization became manifest."³³

Substantially aiding the fiscal situation, Germany also obtained relief from her reparation obligations. Reparations payments were temporarily suspended, and the Dawes plan assigned Germany a much more manageable schedule of payments.

Table G4 documents a pattern that we have seen in the three other hyperinflations: the substantial growth of central bank note and demand deposit liabilities in the months *after* the currency was stabilized. As in the other cases that we have studied, the best explanation for this is that at the margin the postinflation increase in notes was no longer backed by government debt. Instead, in the German case, it was largely backed by discounted commercial bills. The nature of the system of promises and claims behind the central bank's liabilities changed when after the Rentenbank decree the central bank no longer offered additional credit to the government. So once again the interpretation of the time series on central bank notes and deposits must undergo a very substantial change.

By all available measures, the stabilization of the German mark was accompanied by increases in output and employment and decreases in unemployment.³⁴ While 1924 was not a good year for German business, it was much better than 1923. Table G6 is representative of the figures assembled by Graham, and shows that 1924 suffers in comparison with 1922 but that 1925 was a good year. In these figures one cannot find much convincing evidence of a favorable trade-off between inflation and out-

Table G6 Index of Physical Volume
of Production per Capita in Germany

Year	Index of Production	Year	Index of Production
1920	61	1924	77
1921	77	1925	90
1922	86	1926	86
1923	54	1927	111

Source: Graham [7, p. 287].

put, since the year of spectacular inflation, 1923 was a very bad year for employment and physical production. Certainly a large part of the poor performance of 1923 was due to the French occupation of the Ruhr and the policy of passive resistance.

Despite the evident absence of a “Phillips curve” trade-off between inflation and real output in the figures in tables G1 and G6, there is ample evidence that the German inflation was far from “neutral” and that there were important “real effects.” Graham [7] gives evidence that the inflation and the associated reduction in real rates of return to “high-powered” money and other government debt were accompanied by real overinvestment in many kinds of capital goods.³⁵ There is little doubt that the “irrational” structure of capital characterizing Germany after stabilization led to subsequent problems of adjustment in labor and other markets.

2.7 Czechoslovakia

After World War I, the new nation of Czechoslovakia was formed out of territories formerly belonging to Austria and Hungary. Under the leadership of a distinguished minister of finance, Dr. Alois Rasin, immediately after the war Czechoslovakia adopted the conservative fiscal and monetary policies its neighbors adopted only after their currencies had depreciated radically. As a result, Czechoslovakia avoided the hyperinflation experienced by its neighbors.

Under Rasin’s leadership, Czechoslovakia early on showed that it was serious about attaining a stable currency. Even before the peace treaties required it, Czechoslovakia stamped the Austro-Hungarian notes then circulating within its border with the Czechoslovakian stamp, thereby recognizing them as its own debt. There was considerable drama associated with this event, as the National Assembly passed the plans for stamping in secret sessions on 25 February 1919. From 26 February to 9 March, the frontiers of the country were unexpectedly closed and foreign mail service was closed. Only Austro-Hungarian notes circulating within the country could be presented for stamping. As part of the stamping process, the government retained part of the notes in the form of a forced loan.³⁶ About 8 billion crowns were stamped.

A banking office in the Ministry of Finance took over the affairs of the old Austro-Hungarian bank. Czechoslovakia moved quickly to limit by statute the total government note circulation and to prevent inflationary government finance. A law of 10 April 1919 strictly limited the fiduciary or unbacked note circulation of the banking office to about 7 billion crowns. This law was obeyed, and forced the government to finance its expenditures by levying taxes or else issuing debt, which, because of the

statutory restriction on government note issues, were interpreted as promises to tax in the future.

From 1920 on, Czechoslovakia ran only modest deficits on current account (see table C1). Among other taxes, Czechoslovakia imposed a progressive capital levy on property, which raised a cumulative amount of about 11 billion crowns by 1925. It also imposed an increment tax on the increased wealth individuals had obtained during the war.

Table C2 shows the note and deposit liabilities of the banking office. The government's abstention from inflationary finance shows up in these figures.

Table C1 Czechoslovakia, Receipts and Expenditures, 1919-25 (exclusive of expenditures for capital improvements covered by loans)

	1919		1920		1922		1922	
	Esti- mated	Ac- tual	Esti- mated	Ac- tual	Esti- mated	Ac- tual	Esti- mated	Ac- tual
Revenue:								
Ordinary	2,614	—	7,950	—	15,923	—	17,291	—
Extraordinary	1,096	—	2,477	—	1,376	—	1,593	—
Total	3,710	—	10,427	13,455	17,299	21,894	18,884	17,733
Expenditure:								
Ordinary	2,610	—	7,175	—	10,672	—	13,289	—
Extraordinary	6,005	—	8,103	—	7,354	—	6,524	—
Total	8,615	7,450	15,278	13,931	18,026	18,558	19,813	18,663
Deficit	4,905	—	4,851	476	727	—	929	930
Surplus	—	—	—	—	—	3,336	—	—
<hr/>								
	1923		1924		1925			
	Esti- mated	Ac- tual	Esti- mated	Ac- tual	Esti- mated	Ac- tual	Esti- mated	Ac- tual
Revenue:								
Ordinary	17,961	—	15,987	—	—	—	—	—
Extraordinary	851	—	404	—	—	—	—	—
Total	18,812	15,664	16,391	—	15,702	—	—	—
Expenditure:								
Ordinary	13,605	—	12,200	—	—	—	—	—
Extraordinary	5,773	—	4,703	—	—	—	—	—
Total	19,378	16,540	16,993	—	15,974	—	—	—
Deficit	565	876	603	—	272	—	—	—
Surplus	—	—	—	—	—	—	—	—

Source: Young [36, vol. 2, p. 71].

Table C3 shows the path of exchange rates and how, after declining until November 1921, the Czechoslovakian crown rapidly gained to about 3 United States cents.

Table C4 shows the price levels. From 1922 to 1923, Czechoslovakia actually experienced a deflation. Indeed, Rasin's initial plan had been to

Table C2 Note Issue of Banking Office of Czechoslovakia, 1919-24
(in thousands of Czech crowns)

Year	Month	State Notes in Circulation	Year	Month	State Notes in Circulation		
1919	April	—		May	9,717,750		
	May	—		June	9,838,205		
	June	—		July	9,916,077		
	July	161,106		August	10,171,383		
	August	664,997		September	10,196,880		
	September	1,443,570		October	10,139,366		
	October	2,512,199		November	9,996,550		
	November	3,513,405		December	10,064,049		
	December	4,723,303		1923	January	9,222,434	
	1920	January			5,574,688	February	8,947,988
		February			6,462,825	March	9,157,407
		March			7,216,438	April	9,567,369
April		7,216,438	May		9,327,676		
May		8,268,695	June		9,375,991		
June		9,729,233	July		9,448,086		
July		9,267,874	August		9,218,475		
August		9,814,920	September		9,311,378		
September		10,310,228	October		9,278,999		
October		10,920,514	November		9,250,688		
November		10,946,653	December		9,598,903		
December		11,288,512	1924	January	8,820,093		
1921	January	10,888,319		February	8,506,467		
	February	10,914,786		March	8,280,390		
	March	10,921,956		April	8,198,653		
	April	10,928,560		May	9,078,418		
	May	10,851,403		June	8,081,106		
	June	11,167,515		July	8,090,034		
	July	11,134,327		August	9,139,792		
	August	11,455,175		September	8,222,658		
	September	11,570,881		October	8,585,847		
	October	12,327,159		November	8,500,942		
	November	11,871,647		December	8,810,357		
	December	12,129,573	1925	January	7,916,540		
1922	January	11,230,065		February	7,727,880		
	February	10,743,958		March	7,680,867		
	March	10,323,069		April	7,525,934		
	April	10,075,757					

Source: Young [36, vol. 2, pp. 305-6].

Table C3 Czechoslovakian Exchange Rates, 1919–24

Year	Month	Cents per Crown	Year	Month	Cents per Crown	
1919	January	—	1922	April	1.960	
	February	—		May	1.921	
	March	—		June	1.924	
	April	6.135		July	2.185	
	May	—		August	2.902	
	June	—		September	3.231	
	July	5.625		October	3.285	
	August	4.575		November	3.176	
	September	4.575		December	3.097	
	October	3.100		1923	January	2.856
	November	1.950			February	2.958
	December	1.900			March	2.969
1920	January	1.425	April		2.978	
	February	.975	May		2.979	
	March	1.275	June		2.993	
	April	1.530	July		2.997	
	May	2.195	August		2.934	
	June	2.335	September		2.995	
	July	2.195	October		2.971	
	August	1.810	November		2.906	
	September	1.535	December		2.925	
	October	1.245	1924	January	2.898	
	November	1.165		February	2.902	
	December	1.190		March	2.902	
1921	January	1.300		April	2.957	
	February	1.290		May	2.939	
	March	1.307		June	2.936	
	April	1.365		July	2.953	
	May	1.460		August	2.979	
	June	1.420		September	2.993	
	July	1.312		October	2.981	
	August	1.225		November	2.989	
	September	1.160		December	3.018	
	October	1.049	1925	January	3.00	
	November	1.038		February	2.96	
	December	1.249		March	2.97	
1922	January	1.732		April	2.96	
	February	1.855		May	2.96	
	March	1.733		June	2.96	

Source: Young [36, vol. 2, p. 307].

Table C4 **Czechoslovakian Wholesale Prices, 1922-24**

Year	Month	Wholesale Price Index	Year	Month	Wholesale Price Index
1922	January	1,675		October	973
	February	1,520		November	965
	March	1,552		December	984
	April	1,491	1924	January	974
	May	1,471		February	999
	June	1,471		March	1,021
	July	1,464		April	1,008
	August	1,386		May	1,015
	September	1,155		June	981
	October	1,059		July	953
	November	1,017		August	986
	December	999		September	982
1923	January	1,003		October	999
	February	1,019		November	1,013
	March	1,028		December	1,024
	April	1,031	1925	January	1,045
	May	1,030		February	1,048
	June	1,001		March	1,034
	July	968		April	1,019
	August	958		May	1,006
	September	957			

Source: Young [36, vol. 2, p. 307].

Note: July 1914 = 100.

restore the Czechoslovakia crown to the prewar gold par value of the old Austro-Hungarian crown. Following Rasin's assassination, this plan was abandoned and the crown was stabilized at about 2.96 cents.

2.8 Conclusion

The essential measures that ended hyperinflation in each of Germany, Austria, Hungary, and Poland were, first, the creation of an independent central bank that was legally committed to refuse the government's demand for additional unsecured credit and, second, a simultaneous alteration in the fiscal policy regime.³⁷ These measures were interrelated and coordinated. They had the effect of binding the government to place its debt with private parties and foreign governments which would value that debt according to whether it was backed by sufficiently large prospective taxes relative to public expenditures. In each case that we have studied, once it became widely understood that the government would not rely on the central bank for its finances, the inflation terminated and the exchanges stabilized. We have further seen that it was not simply the increasing quantity of central bank notes that caused the

hyperinflation, since in each case the note circulation continued to grow rapidly after the exchange rate and price level had been stabilized. Rather, it was the growth of fiat currency which was unbacked, or backed only by government bills, which there never was a prospect to retire through taxation.

The changes that ended the hyperinflations were not isolated restrictive actions within a given set of rules of the game or general policy. Earlier attempts to stabilize the exchanges in Hungary under Hegedus,³⁸ and also in Germany, failed precisely because they did not change the rules of the game under which fiscal policy had to be conducted.³⁹

In discussing this subject with various people, I have encountered the view that the events described here are so extreme and bizarre that they do not bear on the subject of inflation in the contemporary United States. On the contrary, it is precisely because the events were so extreme that they are relevant. The four incidents we have studied are akin to laboratory experiments in which the elemental forces that cause and can be used to stop inflation are easiest to spot. I believe that these incidents are full of lessons about our own, less drastic predicament with inflation, if only we interpret them correctly.

Notes

1. "Most economists believe that the underlying inflation rate—roughly defined as wage costs less productivity gains—now stands at 9 to 10 percent, and that only a long period of restraint can reduce that rate significantly" (*Newsweek*, 19 May 1980, p. 59).

2. Paul Samuelson has aptly summarized the rational expectations view: "I should report that there is a new school, the so-called 'rational expectationists.' They are optimistic that inflation can be wiped out with little pain if only the government makes *credible* its determination to do so. But neither history nor reason tempt one to bet their way" (*Newsweek*, 28 April 1980). The second sentence of this quote is probably as shrewd a summary of the rational expectations view as can be made in a single sentence. However, it is difficult to agree with the third sentence: as for "reason," no one denies that logically coherent and well-reasoned models underlie the claims of the "rational expectationists"; as for history, the evidence summarized in this paper is surely relevant.

3. There is actually no such thing as a "rational expectations school" in the sense of a collection of economists with an agreed upon model of the economy and view about optimal monetary and fiscal policy. In fact, among economists who use the assumption of rational expectations there is wide disagreement about these matters. What characterizes adherents of the notion of rational expectations is their intention to build models by assuming that private agents understand the dynamic environment in which they operate approximately as well as do government policymakers. Adherence to this notion leaves ample room for substantial diversity about the many other details of a model. For some examples of rational expectations models with diverse implications, see Lucas [21], Barro [2], Wallace [35], Townsend [34], and Sargent and Wallace [31]. Despite their diversity, it is true that all of these models impel us to think about optimal government policy in substantially different ways than were standard in macroeconomics before the advent of the doctrine of rational expectations in the early 1970s.

4. Bresciani-Turroni wrote: "Whoever studies the recent economic history of Europe is struck by a most surprising fact: the rapid monetary restoration of some countries where for several years paper money had continually depreciated. In some cases the stabilization of the exchange was not obtained by a continuous effort, prolonged over a period of years, whose effects would show themselves slowly in the progressive economic and financial restoration of the country, as occurred before the War in several well-known cases of monetary reform. Instead, the passing from a period of tempestuous depreciation of the currency to an almost complete stability of the exchange was very sudden" [3, p. 334]. Compare these remarks with the opinion of Samuelson cited in note 2 above.

5. The notes were "backed" mainly by treasury bills which, in those times, could not be expected to be paid off by levying taxes, but only by printing more notes or treasury bills.

6. League of Nations [13, p. 101].

7. Keynes wrote: "It is not lack of gold but the absence of other internal adjustments which prevents the leading European countries from returning to a pre-war gold standard. Most of them have plenty of gold for the purpose as soon as the other conditions favorable to the restoration of a gold standard have returned" (Keynes [11, p. 132]). Writing about Germany in 1923, Keynes said: "The government cannot introduce a sound money, because, in the absence of other revenue, the printing of an unsound money is the only way by which it can live" (Keynes [10, p. 67]).

8. This view can be expressed more precisely by referring to the technical literature of optimum economic growth. I am recommending that a good first model of the gold standard or other commodity money is a real equilibrium growth model in which a government issues debt, makes expenditures, and collects taxes. Examples of these models were studied by Arrow and Kurz [1]. In such models, government debt is valued according to the same economic considerations that give private debt value, namely, the prospective net revenue stream of the institution issuing the debt. A real equilibrium growth model of this kind can also be used to provide a formal rationalization of my claim below that open market operations in private securities, foreign exchange, and gold should have no effect on the price level, i.e. the value of government demand debt.

9. It is relatively straightforward to produce a variety of workable theoretical models of a commodity money or gold standard, along the lines of note 8. It is considerably more difficult to produce a model of a fiat money, which is costless to produce, inconvertible, and of no utility except in exchange. Kareken and Wallace [9], Wallace [35], and Townsend [34] describe some of the ramifications of this observation. The workable models of fiat money that we do have—for example, those of Townsend [34] and Wallace [35]—immediately raise the question of whether voluntarily held fiat money can continue to be valued at all in the face of substantial budget deficits of the order of magnitude studied in this paper. Such models lead one to assign an important role to government restrictions, particularly on foreign exchange transactions, in maintaining a valued, if involuntarily held, fiat money. Keynes [10] and Nichols [24] also emphasized the role of such restrictions.

10. The sweeping implications of this principle for standard ways of formulating and using econometric models were first described by Lucas [19]. The principle itself has emerged in a variety of contexts involving economic dynamics. For some examples, see Lucas [20] and Sargent and Wallace [30].

11. Sargent and Wallace [32] describe a sense in which it might be difficult to imagine that a regime change can occur. As they discovered, thinking about regime changes in the context of rational expectations models soon leads one to issues of free will.

12. The Treaty of St. Germain, signed in September of 1919, required the successor states of the Austro-Hungarian empire to stamp their share of the notes of the Austro-Hungarian bank. The stamp converted those notes to the currency, i.e. debt, of the new states. The Austrian section of the old Austro-Hungarian bank functioned as the central bank of Austria for several years after the war.

13. Needless to say, the central bank encountered a strong demand for loans at this rate and had to ration credit.

14. At the time, some commentators argued that since the real value of currency had decreased and so in a sense currency was scarce, the increased note issue of the central bank was not the prime cause of the inflation. Some even argued that money was "tight" and that the central bank was valiantly struggling to meet the shortage of currency by adding printing presses and employees. This argument is now widely regarded as fallacious by macroeconomists. Disturbingly, however, one hears the very same argument in the contemporary United States.

15. "In Vienna, during the period of collapse, mushroom exchange banks sprang up at every street corner, where you could change your krone into Zurich francs within a few minutes of receiving them, and so avoid the risk of loss during the time it would take you to reach your usual bank. It became a reasonable criticism to allege that a prudent man at a cafe ordering a bock of beer should order a second bock at the same time, even at the expense of drinking it tepid, lest the price should rise meanwhile" (Keynes [10, p. 51]).

16. See Young [36, vol. 2, p. 16]. That a government might want to adopt such measures if it were using inflationary finance was pointed out by Nichols [24].

17. Pasvolsky [25, p. 116].

18. The content of this protocol is highly sensible when it is remembered that the value of a state's currency and other debt, at least under the gold standard, is determined by its ability to back that debt with an appropriate fiscal policy. In this respect, its situation is no different from that of a firm. In 1922, there was widespread concern within and without Austria that its sovereignty was at risk. (See the desperate note delivered by the Austrian minister to the Supreme Council of the Allied governments quoted by Pasvolsky [25, p. 115]). The first protocol aimed to clarify the extent to which Austria remained a political and economic entity capable of backing its debts. A similar protocol was signed at the inception of Hungary's financial reconstruction.

19. It should be noted that for two years the new bank vigorously exercised its authority to control transactions in foreign currency. Only after March 1925 were restrictions on trading foreign exchange removed.

20. This explanation is consistent with the argument advanced by Fama [6]. There is an alternative explanation of these observations that neglects the distinction between inside and outside money, and that interprets the observations in terms of a demand function for the total quantity of "money." For instance, Cagan [4] posited the demand schedule for money to take the form

$$(1) \quad M_t - P_t = \alpha(E_t P_{t+1} - P_t), \quad \alpha < 0,$$

where P_t is the logarithm of the price level, M_t is the logarithm of the money supply, and $E_t P_{t+1}$ is people's expectation of the log of price next period. There is always a problem in defining an empirical counterpart to M_t , but it is often taken to be the note and deposit liabilities of the central bank or "high-powered" money. The money demand schedule or "portfolio balance" schedule incorporates the idea that people want to hold less wealth in the form of real balances the faster the currency is expected to depreciate. Equation (1) can be solved to give an expression for the equilibrium price level of the form

$$(2) \quad P_t = \frac{1}{1 - \alpha} \sum_{i=0}^{\infty} \left(\frac{\alpha}{\alpha - 1} \right)^i E_t M_{t+i},$$

where $E_t M_{t+i}$ is what at time t people expect the money supply to be at time $t + i$.

Consider the following two experiments. First, suppose that the government engages in a policy, *which everyone knows in advance*, of making the money supply grow at the constant high rate $\mu > 0$ from time 0 to time $T - 1$, and then at the rate zero from time T onward. In this case, the inflation rate would follow the path depicted in figure 2.N.1.

For the second experiment, suppose that initially everyone expected the money supply to increase at the constant rate μ forever but that at time T it becomes known that henceforth the money supply will increase at the rate 0 forever. In this case, the inflation rate takes a

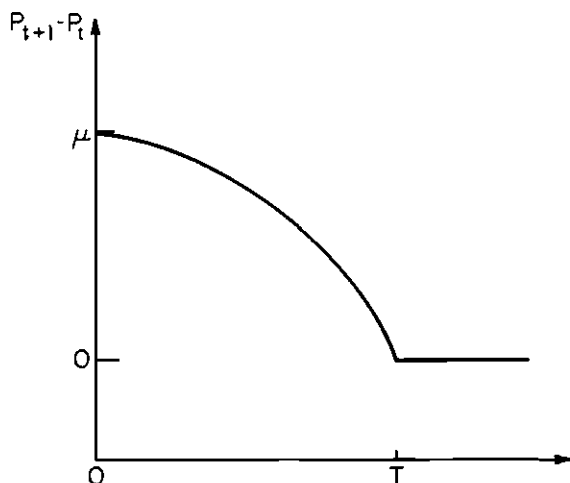


Fig. 2.N.1 Inflation path with an expected decrease in money supply growth from μ to 0 at time T .

sudden drop at time T , as shown by the path in figure 2.N.2. Now since the inflation and the expected inflation rate experience a sudden drop at T in this case, it follows from equation (1) that real balances must increase at T . This will require a sudden once and for all *drop* in the price level at T .

This second example of a previously unexpected decrease in the inflation rate provides the material for an explanation of the growth of the money supplies after currency stabilization. In the face of a previously unexpected, sudden, and permanent drop in the rate of money creation, the only way to avoid a sudden drop in the price level would be to

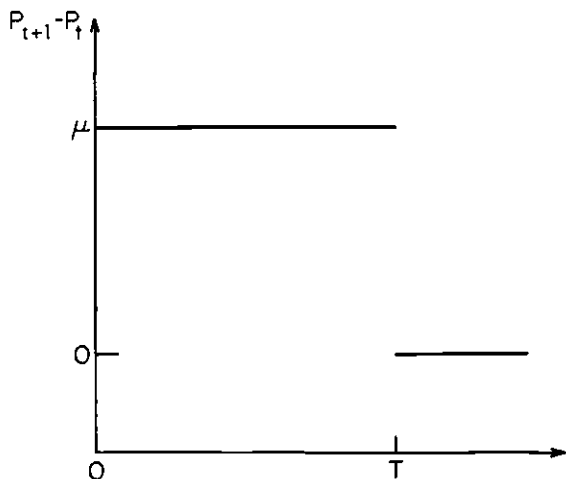


Fig. 2.N.2 Inflation path with a previously unexpected decrease in money supply growth from μ to 0 at time T .

accompany the *decrease* in the rate of money creation with a once and for all *increase* in the money supply. In order to *stabilize* the price level in the face of a decreased rate of change of money, the level of the money supply must jump upward once and for all.

What actually occurred in the four countries studied here was not a once and for all jump but a gradual increase in the money supply over many months. This could be reconciled with the observations within the model (1) if people were assumed only gradually to catch on to the fact of stabilization and to decrease the rate of inflation that they expected as the currency stabilization continued to hold. I find this explanation hard to accept, but it is a possibility.

An alternative way to reconcile the preceding explanation with the gradual upward movement of "high-powered" money after the stabilizations is to add adjustment lags to the portfolio balance schedule (1). For example, consider replacing (1) with

$$(1') \quad (M_t - P_t) = \alpha(E_t P_{t+1} - P_t) + \lambda(M_{t-1} - P_{t-1}) \quad \alpha < 0, 0 < \lambda < 1.$$

In this case, an abrupt stabilization of expected inflation induces only a gradual adjustment of real balances upward at the rate of $1 - \lambda$ per period. My own preference at this point is for an explanation that stresses the distinction between backed and unbacked money.

21. See Pasvolsky [25, p. 161].

22. See Pasvolsky [25, p. 298].

23. Within a year and a half, these became a claim on gold as Britain returned to the gold standard.

24. Unlike Austria, Hungary, and Germany, Poland did not owe war reparations.

25. *League of Nations* [13, p. 111].

26. *Ibid.*, p. 108.

27. See the account in Paxton [26, pp. 146–50].

28. Also see Graham [7, pp. 40–41].

29. Keynes wrote: "A government can live for a long time, even the German government or the Russian government, by printing paper money . . . A government can live by this means when it can live by no other" (Keynes [10, p. 47]).

30. See Young [36, vol. 1, p. 402] and Bresciani-Turroni [3, p. 345].

31. After reading an earlier draft of this paper, John Kennan directed me to the following passage in Constance Reid's biography of the mathematician Hilbert: "In 1923 the inflation ended abruptly through the creation of a new unit of currency called the Rentenmark. Although Hilbert remarked sceptically, 'One cannot solve a problem by changing the name of the independent variable,' the stability of conditions was gradually restored" (Reid [27, pp. 162–63]).

32. Young [36, vol. 1, p. 421].

33. Young [36, vol. 1, p. 422].

34. See Graham [7, chapter 12].

35. Theoretical models of money along the lines proposed by Samuelson [29] predict that too much capital will be accumulated when the government fiscal policy is so profligate that money becomes valueless. See Samuelson [29] and Wallace [35].

36. The frontiers were closed to prevent notes from Austria and Hungary from entering the country. The Treaty of St. Germain, signed 10 September 1919, provided that the successor states should stamp the Austro-Hungarian notes, signifying their assumption of the debt.

37. Of inflationary finance, Keynes wrote: "It is common to speak as though, when a government pays its way by inflation, the people of the country avoid taxation. We have seen this is not so. What is raised by printing notes is just as much taken from the public as is beer-duty or an income-tax. What a government spends the public pay for. There is no such thing as an uncovered deficit. But in some countries it seems possible to please and content the public, for a time at least, by giving them, in return for the taxes they pay, finely

engraved acknowledgments on water-marked paper. The income tax receipts, which we in England receive from the surveyor, we throw into the wastepaper basket; in Germany they call them bank-notes and put them into their pocketbooks; in France they are termed Rentes and are locked up in the family safe" (Keynes [10, pp. 68–69]).

38. See Pasvolsky [25, pp. 304–7].

39. A deep objection to the interpretation in this paragraph can be constructed along the lines of Sargent and Wallace [30], who argue that for a single economy it is impossible to conceive of a rational expectations model in which there can occur a change in regime. In particular, the substantial changes in ways of formulating monetary and fiscal policy associated with the ends of the four inflations studied here can themselves be considered to have been caused by the economic events preceding them. On this interpretation, what we have interpreted as changes in the regime were really only the realization of events and human responses under a single, more complicated regime. This more complicated regime would have to be described in a considerably more involved and "state contingent" way than the simple regimes we have described. I believe that the data of this paper could be described using this view, but that it would substantially complicate the language and require extensive qualifications without altering the main practical implications.

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