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Living with High Inflation

Living with high inflation forces people to adapt every aspect of their economic activities to this peculiarly unstable and unpredictable environment. Even the most routine day-to-day transactions have to be organized differently. In some respects, the survival of relatively normal forms of economic behaviour is striking. The economy does not collapse—at least, not short of actual hyperinflation. But the capacity of individuals and of the economic system as a whole to cope with high inflation should not be exaggerated. Price instability greatly complicates the planning and co-ordination of economic activities. It wastes resources. In the extreme, it wastes them on a grand scale.

THE EFFECTS OF ANTICIPATED INFLATION

It seems appropriate to begin with the effects predicted by the simplest models. Setting the perfect foresight, market-clearing model 'in search of reality', what do we find?

Inflation tax distortions

An inflation running at a constant, predictable rate acts mainly as a tax on money balances, and thus creates incentives to reduce real money holdings. The 'liquidity services' that the inflationary society forgoes in this way can be produced at virtually zero social cost, since the assets that yield them are simply pieces of paper acceptable as media of exchange. The social loss due to the inflation tax can be identified, therefore, with the 'triangle' under the money demand function (cf. Bailey 1956; Friedman 1969). True, if the alternative to the inflation tax is another distortionary tax, the logic of the argument suggests

that, in this second best context, the costs should be compared with one another (Phelps 1973).[1] However, while empirical estimates of money demand functions for relatively stable economies suggest that the welfare loss from anticipated inflation is quite small, they also suggest that the costs are none the less higher than the ones deriving from regular taxes (e.g. Fischer 1981*a*). Even at low levels, inflation appears to be an inefficient form of taxation. And, for high inflations, the welfare loss stemming from the reduction in money balances becomes quite significant, on the same order of magnitude as the revenue the government obtains from inflation, or perhaps even larger (cf., for example, Barro 1972; Driffill *et al.* 1990).

Even a perfectly anticipated inflation would have far from trivial costs, therefore. Still, so saying does not convey an intuitive grasp of the behavioural adaptations that correspond to the lost welfare triangle. Money is not a refrigerator. The picture of money as a service-producing asset is incomplete without a look at transactions practices. 'What money is' and 'what money does' are age-old, still debated, questions. What, then, are the concrete and specific inefficiencies that result from inflation tax avoidance?

The Baumol–Tobin (and Allais) theory of the demand for money directs attention to the transactions costs of moving in and out of money substitutes. The 'shoe-leather' metaphor—the real costs of too many trips to the bank or broker—stems directly from it. This is a narrow view of inflationary distortions, but it serves to point out that the movement out of money will start at the long end. People will not keep money for long periods, since the inflation tax varies in proportion to the holding period while the transactions costs do not. So the 'store of value' function of money is the first to give way. As the inflation rate rises, 'velocity' increases. This accords with the evidence from even quite moderate inflations.

[1] This comparison can produce quite different results depending on how the demand for money is rationalized. Some models would support a positive rate of inflationary taxation in the presence of distortionary taxes, while others maintain the 'optimal currency' position that society should be saturated with the costlessly produced money balances also in that case (cf. Woodford 1990).

A glimpse of cash-balance management in Brazil illustrates, moreover, how high are the shoe-leather costs incurred by agents in high inflations:[2]

'That's all I do in the morning,' says 25-year-old Maria Claudia Gebaili, a secretary at a Sao Paulo newspaper. 'When I come in, the first thing I do is call the bank. Usually it's busy because everybody else is trying to do the same thing. So I have to go over and wait in line to talk to the manager and ask him to take money out of my boss's short-term funds and put some in the checking account to cover the checks he wrote overnight. On Fridays, I always have to make sure that my boss's checking account is emptied because the money left there would be devalued over the weekend. But on Monday morning, some of the checks he wrote over the weekend have already appeared at the bank. So I have to race over to make sure he doesn't get overdrawn. It wears you down.'

In high inflations, people will make great efforts to synchronize payments and receipts. But other payment practices customarily used to economize on money holdings are also eroded by inflation. Trade credit,[3] in particular, becomes harder to negotiate and, like other nominal contracts, is granted on very short term (7 days, for example, when 90 days would have been normal under price stability). This is not an effect of anticipated inflation itself, but it suggests that, as inflation rises, the set of 'credit goods'[4] tends to shrink and cash requirements consequently rise. However, other adaptations work in the expected direction. Firms may enter into arrangements with one another

[2] The quote is taken from an article in the *Wall Street Journal*, 29 January 1990 ('Daily Inflation Struggle Obsesses Brazil', by Thomas Kamm). At the time, Brazil was experiencing very high inflation. Keynes (1923) and Bresciani-Turroni (1937) present vivid examples of the lengths to which people went in order to economize on cash balances in the German and other European hyperinflations of the 1920s. While people may not go to quite the same extremes, all the same economic strategems are observable also in high inflations.

[3] Ferris (1981) notes that the typical firm is simultaneously both a borrower and a lender, on basically identical terms, of trade credit. His model explains how trade credit arrangements permit networks of firms to pre-plan the timing of cash settlements so as to reduce money balances.

[4] Credit goods as opposed to 'cash goods'. The terminology is that of Lucas and Stokey (1983).

in order to get rid of unwanted surpluses of money when their cash flows are systematically out of phase (as, for example, if they pay wages on different days).

In other markets, transactions are often 'dollarized'. This is especially likely to happen in the markets for real estate and consumer durables. None the less, purchases of everyday consumer goods continue to be settled in domestic currency. The result is that the economy operates in effect with two currencies (or perhaps more), with each one used in different types of transactions. Wages are paid in domestic money, and the payment period generally does not change unless the inflation rate gets extremely high. Households adapt by building up inventories of consumer goods on paydays and the more well-to-do among them will quickly place the rest of their current earnings in short-term deposits or convert them into foreign currencies.

Some of these strategies to reduce real money balances are simply a matter of individual choice; others, such as switching to another currency of settlement, require a large number of transactors to co-ordinate their actions. In either case, such adaptations often involve investments, either in physical form, such as the introduction of automatic tellers by banks, or in working out new practices and arrangements. Once made, these investments allow agents to manage with lower money holdings more or less permanently. To that extent the inflation-induced drop in money demand becomes irreversible, thus reducing the base of the inflation tax in the long run. This 'hysteresis' effect has been studied empirically in both Argentina and Israel (cf. Ahumada 1988; Piterman 1988).

People will incur large transaction costs to elude a high inflation tax. These costs exist because substitute arrangements to the use of money are not easily found, except in special cases. Money retains its property as a medium of exchange even when taxed at exorbitant rates. Economic theory hardly prepares us for this fact. Why do high and foreseen inflations not lead to the disappearance of the taxed money? Why do they not lead to the smooth evolution of exchanges with other media, if needed, throughout the economy? The 'foundations' of monetary theory are in an unsatisfactory state.

This lack of secure foundations is commonly taken to be a problem that is as arcane as it is intractable and, therefore, one suitably left to the patient attention of ivory-tower specialists in pure theory. But it is anything but an academic problem in extremely high inflations. In the hyperinflationary limit, it becomes critical to know, for instance, whether the demand for transactions balances has a minimum below which it will not go, or whether it will converge asymptotically to zero as inflation rises, or whether at some point it will drop in a sudden catastrophe as people decide to switch altogether to another means of payment. The question of how long and to what extent domestic money may 'hang in there' becomes an intensely practical, highly urgent one—to which theory, pure or otherwise, gives hardly a hint of an answer.

Incidence of the inflation tax

The focus on transactions costs has the merit of drawing attention to how unevenly the ability to elude the inflation tax is distributed. High inflation certainly forces the average individual to become more financially sophisticated and also induces banks and other intermediaries to offer new money substitutes (if central banks so allow) and to increase the number of their branches and other facilities.[5] But it is well-informed people of means who have ease of access to financial instruments. Just moving about the city for the purpose is a trivial matter for the well-to-do, but not so for the poor. Minimum size requirements for bank deposits and foreign exchange transactions are fixed costs which bar the entrance of low-income people into those markets. The well-to-do, moreover, tend to have both the discretionary income and the complementary resources (such as

[5] It is a common observation that the 'physical' size of the banking sector tended to grow in the Latin American high inflations; Bresciani-Turroni (1937) noticed the same tendency in the German episode of the 1920s. This diversion of resources into financial activities does not mean, however, that the real value of the intermediated funds increases, since erratic inflation discourages the holding of domestic assets in general (see below) and since banks are typically forced to immobilize a large proportion of deposits in the form of required reserves at the central bank.

cars and freezers) that will allow them to bunch purchases early in the month when prices are 'low', whereas the poor are more or less constrained to carry a larger proportion of their income to the end of the pay period. Although a precise measure of tax incidence may be hard to get, there are thus a number of reasons to believe that the inflation tax is distributionally regressive (cf. Ahumada *et al.* 1993; Sturzenegger 1992*a*, 1992*b*). The point is worth stressing because the notion that anti-inflationary policy measures are regressive is so deeply ingrained in much of the literature.

Liquidity constraints

'Too much money chasing too few goods'—so runs the popular cliché about inflation. But whereas nominal balances keep increasing, real balances shrink. If money is an institution to facilitate exchange, one would expect lower real balances to be associated with fewer trades. Such effects can be modelled in relatively simple ways, albeit for highly stylized environments. Consider, for instance, an exchange economy where two types of transactors have inversely correlated endowment flows, so that the consumption streams of both can be smoothed by engaging in periodically reversing exchanges. Suppose further that the social contrivance of money is the vehicle for effecting these transfers; agents of type A accumulate real balances in high A-income periods to augment their consumption in low A-income periods by purchases from type B agents. A tax on real balances will clearly cause this trade to be curtailed.[6]

How much relevance can one attribute to such highly stylized models? In moderate inflations, the effects on everyday trade opportunities of the tax on money balances are unlikely to be of much significance. Even in high inflations, as long as they fall short of hyperinflation, the commodity trades of households are probably not all that much affected. Where the cash constraint will bite for most people is, first, in the ability to exploit more

[6] The example is due to Michael Woodford, who in discussion of these problems sketched a formal version of it based on the model by Bewley (1980). See also Casella and Feinstein (1990).

or less randomly occurring 'bargains'. This requires ready cash, for opportunities of this sort evaporate quickly and have to be grasped on the spot. A second effect occurs because people try to get along with virtually no precautionary balances. In bunching their purchases as far as possible early in the earnings period, they choose an illiquid position and thus take a bet on the contingencies that may happen before next payday. An unexpected medical expenditure, for instance, can easily unbalance the household budget and force a deep cut in consumption subsequently. This kind of risk seems to contribute much to the distaste that people, and especially low-income workers, feel for price instability. The fear of not 'getting to the end of the month' is a typical complaint often voiced in high inflations.

Other effects

Theory suggests that inflation should induce a change in the composition of portfolios. The effect most often adduced, in the technical literature as well as in popular discussion, is a shift from financial assets into real capital. Financial assets, the argument goes, will at least in part be subject to the inflation tax, whereas real capital is presumed to be a 'hedge against inflation'. One should not quarrel with the logic of this hypothesis in the context of the models used to derive it. But the proposition that high inflation promotes capital accumulation is utterly misleading. The very opposite is true. The various ways in which inflation disturbs economic growth will have to be considered further below, out of the context of anticipated inflation models.

A number of phenomena can be rationalized, albeit in somewhat *ad hoc* manner, under the assumption that the rise in the general price level is fully anticipated. For example, the commonly found association between inflation and relative price variability can be explained, after a fashion, by postulating costs of changing money prices and lack of synchronization in price revisions (Sheshinski and Weiss 1977; Danziger 1987). More variability in relative prices, furthermore, should induce more customer search (Bénabou 1988), although there are

other, and probably stronger effects acting in the opposite direction (see below).

The conception of inflation as just a predictable rate of depreciation of money permits one to build simple, tractable models that yield definite results. So it pays in simplicity to stay as close as possible to this conception. But these extensions of models of a frictionless, predictable economy are of limited use. The presupposition that only menu costs prevent price setters from tracking the inflation rate perfectly constitutes a refusal by theorists to take the pricing problems of sellers seriously. Moreover, when prices lose their residual stickiness in hyperinflation, the noise in relative prices does not die away—if anything, it gets louder.[7]

Having set the model of a perfectly anticipated inflation in search of a reality to fit we will not attempt to stretch it to take in further ground. In the end, some quite crucial aspects of high inflations, from the way they originate to their economic consequences, are in any case going to be left out. It is time to turn to the 'reality (still) in search of models'.

INFORMATION AND THE SHORTENING OF PLANNING HORIZONS

Ask a chosen-at-random citizen of a low inflation country what last month's increase in the CPI was and he or she will most probably decline to answer. This monthly figure, although regularly published and easily available, is of no interest to him or her except maybe in very special circumstances. The average transactor in such an economy does not make decisions based on such high frequency observations. Some people will keep an eye on the price trend as described by annualized data, but that will be the extent of their interest in inflation. If the need arises,

[7] This is not an altogether uncontroversial assertion. As long as many consumer goods continue to be priced in terms of the domestic unit of account, relative price variability seems to vary monotonically with inflation. It may be that in the very last stage of hyperinflation virtually all goods get 'dollarized', and that relative price variability collapses at that point. The issue is discussed further in the next section and again in Chapter 7.

prices can be predicted one month or one year ahead with some precision; even the most naive forecasts will have errors no larger than a few percentage points.

Next repeat the experiment in a high inflation economy. Here the subject will be unable to recall the inflation figure for the past 12-month period, not because the number is large, but because it is irrelevant. Price changes over so long a period do not provide information of any use for current plans. Shift the question to the monthly CPI and the agent is not only likely to know the figure, but he may comment on the behaviour of the index component by component and offer personal reflections on the chances, say, that current policies will finally bring about 'single digit inflation' in the coming month. While he will probably make quite a well-informed impression, he will not even try to risk a projection of the price level beyond one month or two, and his guess over that horizon will in any case have a sizeable margin of error.

Now make the enquiry in a country in the midst of a hyperinflation. The subject might have a recollection of the latest published monthly inflation rate, but will treat this as a matter of historical record. A monthly interval is now perceived as a long run. In this case, weekly or even daily indices are in high demand, and people will focus their attention on variables for which such high frequency observations are available. In hyperinflations, hourly movements in the exchange rate often make front-page news in the papers. But, of course, the news refers to yesterday's events, and may not be informative as to what is happening right now.

This change in time perspective is characteristic of the difference between inflationary regimes. It applies not only to how agents view aggregate price level movements but real variables as well. In high inflations, real and nominal instability are intertwined. The steady high inflation where the real economy evolves undisturbed except for the distortion of the tax on money balances is a theoretical construction without empirical counterpart.

As we have suggested in the previous chapter, reliance on the inflation tax is almost by definition associated with unsteady economic policies. The context in which private sector activities

take place, therefore, is one where governments operate without well-defined budgets and are subject to the immediate pressure of numerous urgent demands. Policies are likely to change course as new emergencies become the focal point of public attention, and the authorities use their imagination in dealing with them. If the country is indebted, its actual debt payments will be subject to periodic renegotiations and are consequently not known in advance. Future real exchange rates and real wages and profit rates will depend on the outcome of the bargaining with creditors. Thus, the prospective real returns to specific activities are typically highly uncertain. Policy instability and external shocks complicate private decision-making. Governments, on their side, cannot anticipate with confidence how the economy will respond to their actions.

In those circumstances, people express a strong demand for information, raw and processed. The time and effort spent on keeping informed increase. The diversion of resources by people trying to make sense of where the economy is going is one of the subtle but more important costs of instability (cf. Okun 1975; Leijonhufvud 1977; Dornbusch and De Pablo 1989; Sturzenegger and Tommasi 1991). But the price of knowledge (as it were) rises faster. The joint complexity of the political games and the market reactions becomes such that the models people use to form expectations and decide a course of action become more and more inadequate even as the data requirements increase. Some rough empirical generalizations can be relied upon, of course. People living in high inflation will not miss the connection between deficits, money and prices, for example. However, experience will not dictate a unique way of interpreting the available facts. At any given moment, reasonable people may react differently to the same set of data.

Moreover, incoherent beliefs make learning more difficult. If market behaviour is not only driven by 'fundamental' (as seen through agent A's model, say), but also by expectations (which, from A's point of view are on the whole both unobservable and idiosyncratic), then A will have a hard time distinguishing one effect from the other. Beyond a certain point, therefore, the complexity of the situation becomes self-reinforcing.

The uncertainty that the individual agent confronts increases rapidly with the distance from the present. Over a short time horizon, the individual may be able to guess what group will be most favoured in the next round of the fiscal game, what exchange rate policy will be followed, and so on. These guesses may be inaccurate, but it is still possible to act on them. What is practically impossible to know more than a few steps ahead is what outcomes will be produced by the sequence of moves made by all actors in the economic game. The range of possibilities is simply too wide to sort through. The uncertainty is not that of a game of chance. Instead, people constantly find themselves in situations where they know that tomorrow will bring news that will inform them of what futures are probable beyond tomorrow, but where they cannot guess today what that information may be like.

The end result is that agents, public and private, have to act on the basis of knowledge that is much less reliable than in a stable economy, although they give the superficial impression of being alert and sophisticated in their analysis of events. Not to act, or to postpone action, will then often be the preferred course (cf. Hicks 1974, ch. 2). When one knows that one does not know how to form expectations with confidence, the safest course is usually just to withdraw from the game.

People engage in active 'speculation' on the short-run course of the economy, but they are reluctant to commit resources over long horizons. Their decisions on setting prices, on buying and selling, and on managing portfolios are predicated on opinions about where government policies and aggregate prices are heading. Actions that cannot be reversed for some time will be undertaken only if they promise very high yields. A radical alternative, of course, is just to move whatever assets are moveable out of the country. By their very nature, high inflations are associated with high 'country risk' and, consequently, with capital flight. Long-run positions in financial assets will be held abroad.[8] This has feedback effects. Rapid reactions of capital

[8] It should be noted, however, that not all high inflation economies show the same propensity for capital flight. During the high inflation periods of the 1980s, for example, the outflow of private funds from Argentina seems to have been larger in relative terms than from Brazil.

flows to political or other news cause exchange rate and price volatility and, insofar as this in turn restricts growth, it also makes the budget situation worse (cf. Dornbusch 1991).

High inflation tends to reduce investment. It leads firms to require larger anticipated returns and shorter repayment periods; at the same time, it makes projects harder to finance. Instability 'dulls animal spirits', and channels them into political lobbying and short-run gambling in financial markets. The consequences may extend to intangible forms of investment. For reputational considerations to constrain opportunistic behaviour, agents must care about the future. When repeated interaction becomes less probable or when people start to discount delayed payoffs more heavily, 'hit and run' tactics that produce short-run gains will become more common. Unstable environments reduce the scope for co-operative modes of behaviour.

CONTRACTING

Flexibility can be purchased, at a cost, by delaying decisions, by loading portfolios with liquid rather than 'fixed' assets and by reducing specialization in production. Many ventures, however, are such that they cannot take place unless the parties make specific, irreversible investments of one sort or another. When that is the case, they must have some sort of guarantee that the arrangement will last for a certain period on more or less well-specified terms. Contracts are, of course, also essential to make resources flow through financial channels. But, in high inflation environments, individuals are unable to ascertain in what 'real' conditions they and their potential partners will find themselves in the future. The instability of prices also makes it harder to specify a mutually agreeable denominator for future payments. Consequently, simple long-term contracts and especially those specified in nominal terms come to be seen as very risky.

Transactors can adapt at three margins. First, they can write more complicated contracts that make future payments contingent on a larger set of 'states of the world' according to

whatever sources of risk they see as salient. Second, they may shorten the maturity of contracts and incur the resulting costs of periodic renegotiation. In this case, they have to accept that they do not know what the exact terms of the next agreement will be and take the chance that next time an agreement might not be reached. Third, they can simply refrain from entering into contracts that inflation has made too risky. In that case fewer transactions are realized, markets become thinner, and some markets are thinned out of existence. The high inflation economy ends up with an impoverished set of markets compared to what one would find in an otherwise similar but stable economy. The qualitative evidence available shows that high inflation induces all three types of adaptation.

As the economy grows more unstable, one might expect to find agents increasingly willing to trade risks among themselves. But complicated contracts are difficult to write and to enforce, and people can shy away from them for fear of being exploited by more knowledgeable transactors—if the other party wants to include an uncommon clause, maybe 'he knows something that I don't'. Although various forms of indexing do emerge,[9] the typical written contract remains simple and relatively standardized. The overall impression of these new index contracts is not that they represent contractual innovations providing 'mutual insurance' of a sort that would enhance the welfare of the parties even were they living under monetary stability. On the contrary, they emerge as attempts to find acceptable substitutes for the nominal standard of stable economies. As such they are only partially successful.

The baskets of goods in terms of which the two parties to a business contract would most prefer to stabilize 'real' payments will often differ. The inputs and intermediate goods that are the

[9] In addition to the use of conventional indexing clauses in the German inflation of the 1920s, Bresciani-Turroni (1937, p. 310) refers to a practice of linking payments to the prices of specific goods such as coal, lignite, electricity, and rye. In Argentina, it was common to index public sector contracts by 'polynomial' formulas weighing different indices (e.g. particular components of the CPI or WPI, wages, the exchange rate) as an approximation to the unit cost of the input basket of the supplier. This last type of contract, it may be noted, is not immune to the reporting lag problem (see below).

most important to the two parties in a customer–supplier relationship, for example, will most often be very different. Consequently, the choice of the adjustment formula becomes the cause of sometimes lengthy negotiations. This decentralized search for an acceptable standard of contract is not likely to converge—at least not short of universal 'dollarization'. In Brazil, in 1993, some 30 different indices were said to be in use.[10]

An agreed-upon adjustment formula can still result in completely unintended outcomes when prices are very volatile. The Argentine legal system, for example, evolved a 'doctrine of unforeseeability' (*doctrina de imprevisibilidad*) by which a party to an indexed contract could obtain a revision of the original agreement if its escalator showed large deviations from the aggregate price level. But, in a state of high inflation, a new price swing can easily undo the effects of the legally enforced escape clause.[11] Naturally, such economic and legal complications increase the perceived cost of contracting and consequently reduce people's willingness to make long, binding commitments, especially if the index proposed as an escalator is not a standard one.

Large numbers of contracts end up being indexed to the CPI or some similar 'standard' basket. In some cases, such as Brazil or Israel, CPI-based indexation was promoted by the government which, for instance, established legal adjustment clauses for wages. In other cases, such as that of Argentina, it developed more spontaneously. The CPI does have some attractive

[10] *El Cronista* (Buenos Aires), 10 December 1993: 'Industrial firms like Xerox, for example, use up to 11 indices to adjust accounts receivable and payable with customers and suppliers. Exporters typically use the dollar, but a number of sectoral indices are also in use.'

[11] It occurred that a court would grant one party to a contract a change in the adjustment clause of an ongoing contract but the 'winning' party ended worse off than if the contract had been kept in its original form, as the relative price movement subsequently reversed itself. If real wages had fallen, for example, a plaintiff might persuade the court to change the indexing of payments from the CPI to a wage index—only to find that real wages would then start to rise. In a somewhat curious twist, second-generation contracts eventually evolved in which the parties explicitly resigned their right to initiate legal action based on the 'unforeseeability doctrine'.

features as an escalator of payments. The index is available for all individuals at the same time and clearly cannot be manipulated by the parties to a private contract.[12] Its very visibility, furthermore, means that it will come under instant scrutiny should its accuracy become suspect.[13] When this form of contract becomes predominant, linking payments to the CPI avoids bargaining costs. Once the practice becomes widespread, moreover, it will impart inertia to the inflation rate. This inertia in turn tends to limit the variability of the real value of payments even when the information that the index conveys only becomes available with some delay (cf. Chapter 2 above).

The specific characteristics of the arrangements used to escalate payments vary from country to country. For example, at the beginning of 1986, with inflation around 15 per cent per month, wages in Brazil were adjusted every 6 months based on an explicit indexation formula. In early 1985, when inflation ranged between 20 and 30 per cent per month, the Argentinian practice was one of monthly wage adjustments. These wage increases were often made with reference to the rate of growth of the CPI in the previous month, but they were not predetermined by a contractual indexation clause. The German experience of the 1920s shows an interesting example of how wage adjustments evolved as inflation accelerated. At first, the length of nominal contracts shortened, and indexation gradually became common. Later on, at very high rates of inflation, wages were sometimes linked to the exchange rate. When the inflation reached hyperinflationary levels, in August 1923, trade unions and business firms agreed on a system by which wages were adjusted according to the price level expected for the following week; forecast errors were corrected by retroactive

[12] But private parties will still find a way to profit. In Brazil, some investment funds maintained their own organizations for sampling consumer prices. This enabled them to predict some days in advance what the next revision in the nominal value of government bonds would be—and to profit handsomely thereby. In a stable monetary regime, financial expertise of this order might be put to better social use!

[13] There may have been cases in which governments manipulated the price indices in order to influence the outcome of private sector contracts. For instance, the Chilean military government may have used this unorthodox tool to de-index wages in the 1970s. Cf. Cortázar (1983).

compensation in the next payment (Bresciani-Turroni 1937). It is not clear how this complicated scheme was applied in practice, since it remained in effect for only a short period.

CPI indexation brings with it problems both for short and for long contracts which become particularly serious when the inflation rate is highly variable. The indices never report truly contemporaneous prices; they are compiled only intermittently; and they are published only with a lag. Indexation, therefore, is necessarily backward-looking. Hence, it makes little sense to index very short contracts, since the adjustment term would either be predetermined (if the contract terminates before the next date the index is scheduled to be published) or else would incorporate mostly price movements that occurred before the start of the contract. Very long indexed contracts, on the other hand, can generate highly variable real payments if the inflation rate is volatile. An indexed sum retains approximately constant purchasing power over the CPI basket only when the inflation rate is of the same order of magnitude in the current period as it was at the start of the contract. This condition is far from always satisfied. In Argentina in the late 1980s, for instance, the monthly growth rate of the CPI ranged between a minimum of 2 per cent and a maximum of almost 200 per cent.

Nominal contracting over long periods is a feature of economies where the price level is expected to remain stable, or at least predictable. Similarly, indexation is useful if the inflation rate is more or less steady. Widespread indexing, therefore, appears to be specific to a certain class of inflationary regimes. It may help to preserve long-run contracting in moderate-to-high inflations, but not when the inflation rate is highly volatile. We conjecture that the longest typical length of indexed contracts will be of the same order of magnitude as the period over which the variance of inflation remains within a certain tolerance limit. Thus, a very erratic inflation would reduce the number of long-indexed contracts and, beyond that limit, make the corresponding markets disappear.

There are alternative indexing arrangements which are not subject to a reporting lag. The simplest ones are those where payments are linked to the movements of the exchange rate or

else directly denominated in foreign currencies. However, the link between the exchange rate and the aggregate price level is not one of proportionality, even in hyperinflation (see below). For most people, maintaining constant purchasing power over a basket of foreign goods is of little or no help if, in so doing, their command over the domestic goods that are the stuff of their daily lives is rendered more variable. When some people keep a good portion of their wealth in foreign assets they do not do so because it makes their wealth in terms of domestic goods more predictable, but mainly because they are unwilling to lend to other residents.

Some markets may become dollarized. For a market in houses and apartments to function, sellers must be able to post a price which can be maintained for some time. They do so by quoting in dollars. The alternative wealth-placements for buyers may also be abroad and they are likely to finance purchases out of foreign currency holdings. That real estate and perhaps other durable assets are transacted in a stable currency does not mean that corresponding credit markets will develop. In Argentina, for instance, houses were purchased by paying cash dollars, but there were no suppliers of dollar-linked mortgages.[14]

At the very short end of the maturity spectrum, nominal contracts still survive in high inflations. The demand for short-run interest-bearing assets is fed from two sides as people move away both from money and from long-run portfolios. But, as inflation becomes more and more erratic, they refuse to hold deposits with maturities extending longer than a few days. In the limit, if the economy approaches hyperinflation, only the offer of extremely high yields will induce people to keep funds in the banks at all. In less extreme cases, an active market for short-run nominal credits may survive, but it is not likely that

[14] In fact, a market for multi-year dollar loans only began to emerge after the start of the 1991 stabilization programme, which fixed the exchange rate by law. People chose not to make long-term contracts in dollars when the domestic currency was unstable, but began doing so as soon as the exchange rate was fixed at one-for-one.

it will maintain the volume of intermediation[15] as inflation rises. Moreover, many transactions in this market are probably based on differences in inflationary expectations and would not have taken place if both parties had similar beliefs. Although mutually agreeable, such 'speculative' trades on the whole do not serve efficiency in resource allocation.

In sum, economies in high inflation end up operating on a *triple standard* of deferred payments: very short contracts stay nominal; agreements of intermediate term such as housing rentals and wage settlements become indexed; and transactions in real estate and certain durable physical assets are foreign-currency denominated. But markets for long-term contracts are lacking no matter what the standard. Such a triple standard system is shot through with problems and inconsistencies of various kinds. For example, real estate prices may be quoted in dollars, but the purchase or holding of real estate cannot be financed by credit in any currency. When the exchange rate varies, this changes the relative price of dollarized houses and indexed rentals for reasons totally unrelated to the state of the two markets in question. Individual real incomes oscillate as the adjustment formulas of the contracts they depend on fail to track the changes in consumer goods prices. Prospective investors who rely on bank financing have to count on constantly rolling over loans with a maturity of a few weeks at real interest rates that vary between exorbitantly positive and rewardingly negative values. Gamble for gamble, it is not surprising that they often prefer to place their bets day by day in the foreign exchange market.

Productive enterprise is not such a day-to-day affair—and it suffers.

[15] For example, interest-yielding bank deposits in Argentina fell from a little above 20% of GDP in 1980 to 12% in 1988. This period does not include any episodes of hyperinflation. Moreover, in both years of comparison, interest rates were unregulated.

CURRENT TRANSACTIONS

Short of hyperinflation, the economy retains some residual stability over limited periods of time and this allows agents to predict roughly what market conditions they will face in the most immediate future. This residual stability results from the survival of business practices that seek to avoid violent swings in nominal prices. Even at very high inflation rates, the prices of currently produced goods still continue to be quoted in domestic money and the interval between revisions of fix-prices never quite shrinks to zero. None the less, prices become exceedingly volatile.

Although the empirical findings are still under discussion (cf. Driffill *et al.* 1990), the evidence indicates a connection between the level and the variability of the inflation rate, and between those two variables and relative price variability.[16] In general, prediction errors for the price level are larger the higher the average inflation rate. The variance of relative price changes increases with the inflation rate, both in month-to-month data and when longer periods with different average levels of inflation are compared. In monthly data, the 'unanticipated' component of inflation has the stronger correlation with relative price variability, but a distinct effect of the 'anticipated' component remains.[17] Moreover, at higher rates of inflation, it

[16] The literature on this subject is large. See, for example, Glejser (1965), Vining and Elwertowski (1976), Parks (1978), Blejer and Leiderman (1980), Logue and Sweeney (1981), Fischer (1981*b*), Sheshinski *et al.* (1981), Blejer (1983), Pagan *et al.* (1983), Marquez and Vining (1984), Domberger (1987), Van Hoomissen (1988), Palerm (1990), Tommasi (1992*b*), Weiss (1992) and Dabús (1993). Palerm surveys the literature in considerable detail.

[17] However, Lach and Tsiddon (1992), working with highly disaggregated data (prices of 26 food products, each reported by a substantial number of sales outlets), find the effect of expected inflation to be stronger than that of unexpected inflation. In 'islands' models, relative price variability depends on unanticipated inflation; evidence for the role of anticipated inflation is often taken to favour the 'menu cost' explanation. Whether 'the' rate of inflation measures the behaviourally relevant variable at the level of any particular individual's decision is questionable, however, and this is even more so with its anticipated and unanticipated components. Cf., again, Jonung (1981). It is quite uncertain, therefore, whether regressions on these components can do much to help us discriminate between the two classes of models.

appears that relative prices of similar goods, and relative prices of the same good at different locations, show increased variability; in addition, at any given moment, the prices quoted by different sellers of the same good show larger dispersion.

The 'noise' in relative prices that characterizes high inflation regimes need not derive from a single source. Frequent policy turnarounds, or external disturbances, are likely to induce swings in the relative prices of broad categories of goods. Large movements in relative prices are commonly observed in connection with devaluations or discrete adjustments in public sector prices, for example. Firms setting prices in a high inflation must in any case act in haste and on the basis of information of very limited reliability. The 'islands model' (cf. Phelps 1970; Lucas 1973; Cukierman 1979, 1982) illustrates the problem of discriminating between aggregate and specific shocks. It suggests that sellers will make their prices respond more elastically to 'local' information as the volatility of the aggregate price level increases. In addition, every individual seller posting a price that will be maintained for some time has to exercise his own judgement about market conditions in the near future: differences in the way agents 'read' the data will be reflected in the prices they set. The dispersion and variability of relative prices due to the use of partial information and to idiosyncratic beliefs gets amplified, rather than tuned down, as prices are revised more frequently (cf. Kaufman 1992). The main problem, it appears, is not that some prices adjust while others 'stick'; it is rather that most prices become excessively volatile (cf. Chapter 7 below).

Segmentation of markets becomes ubiquitous in a high inflation. The 'law of one price' often fails even over short distances. And such price differences are not eliminated through arbitrage. Price instability makes 'comparison shopping' much more difficult. Learning the price of a good in a particular shop does not tell the shopper much if his or her information about prices of similar goods at other places is dated, since those prices have almost certainly changed in the meantime. As a consequence, while price dispersion may induce agents to search more intensively, they will none the less be less informed when deciding on

a purchase. Since price competition becomes a less effective way of attracting customers, average mark-ups are very likely to increase (Tommasi 1992*a*; see also Frenkel 1979).

Firms face a perpetual dilemma in a high inflation. They need not only to make more frequent corrections but also to provide an 'orderly market' for their customers.[18] The pricing practices observed stem from the compromises they make between these requirements. Businesses that keep prices fixed for a certain interval (say, on the order of the average holding period of money) make it possible for their customers to know approximately 'what their money can buy'. This is a valuable service to consumers in that it allows them to do their purchases sequentially out of the cash they carry with them. This is probably one reason why even at extremely high rates of inflation retail markets resist 'dollarizing' prices. While manufacturers are often motivated to dollarize, especially if their products are import-intensive, and may face little or no direct resistance from distributors and wholesalers when they do so, retailers will rebel as long as their customers earn their incomes in domestic money. When all such 'stickiness' of nominal prices disappears, money in effect loses its function as the unit of account for prices of everyday goods, and retail trade is most definitely disrupted.

OVER THE BRINK: 'CLOSED FOR LACK OF PRICES'

Inflation causes the intertemporal structure of markets to shrink, starting at the long end. In moderate inflations, it may be only the markets for 30-year bonds and fixed-rate mortgages

[18] Palerm (1990, p. 477) stresses this in interpreting his findings from the Mexican data: 'the discrete price adjustment in the fix-price sector is the product of an optimal policy by market-makers striving to offer stable trading arrangements. The rise in frequency [of price revisions] as inflation rises may well be an indication of the difficulties that market-makers face in maintaining a stable trading environment for their customers under high and unstable inflation. This shattering of market arrangements leads to a greater price variability.' Palerm's work on Mexico offers a rich empirical picture of price behaviour in an inflationary economy. His findings will be further discussed in Chapter 7 below.

that disappear. In high inflations, bank loans and trade credit of a few weeks maturity may be the longest term financial instruments surviving in the private sector. The limit is reached in hyperinflation, when even spot markets threaten to close down.

The movement into hyperinflation tends to come as a sudden phase transition. The onset therefore can often be dated rather precisely. In the German case, for example, the assassination of Rathenau in mid-1922 and the crisis that followed the occupation of the Ruhr in early 1923 were followed by sudden jumps in the already high inflation rate. Argentina burst into hyperinflation in early 1989 and, again in December, following the collapse of disinflation programmes; in both instances, the inflation rate went from single-digit monthly figures to well above 50 per cent in a few weeks. Although the class of events that may trigger this transition is not easy to define, it is clear enough that economies at the high end of the high inflation range walk a tightrope. The shortening of the horizon over which agents are willing to make commitments indicates that they are 'ready to go'. People hold money-denominated assets for only a few days. Virtually any alarming news can precipitate a rush into foreign currencies. Firms change their prices with such frequency that inflationary impulses are swiftly propagated. As the risk of prices suddenly accelerating grows, wage-setting schemes that extrapolate past price trends and therefore impart upward inertia to wages become less and less acceptable to labour. They become prone, therefore, to give way suddenly to forward-looking arrangements. When this anchor lets go, one of the few remaining links between past and current prices is lost.

In hyperinflation, agents must recalculate their plans from day to day, or even from hour to hour. Commonplace activities like selling a product off the shelf now become risky. Uncertain over restocking costs, firms build large precautionary margins into their prices; in the limit, they just stop selling. The signs posted in many shops during Argentinian bouts of hyperinflation, 'Closed for Lack of Prices', reveal in a striking way how some people will simply quit trading when deprived of any and

all guideposts to the real outcomes of transactions.[19] Thus, shortages of goods arise spontaneously, without outside intervention. When the economic system has to recompute prices continuously, the result of this ultimate price flexibility is not efficiency but the very opposite.

As the inflation rate reaches levels of several percentage points per day, money demand falls drastically. But the decline is actually less dramatic than estimates of interest-elasticities for periods of less extreme inflation would lead one to predict. The government still conducts its transactions in domestic money and workers typically continue to receive their wages in that currency. This is probably an important reason why money remains acceptable in retail, although payment in foreign currencies becomes more common. In some episodes one finds instances of firms setting different prices according to the medium of exchange they are offered.[20] Since hyperinflations usually last only for short periods, it is hard to establish whether the demand for domestic money can be sustained indefinitely at such high inflation rates, or whether agents would altogether stop accepting it at some point. Be that as it may,

[19] The reluctance to engage in trade in moments of great uncertainty during a hyperinflation can be illustrated by the following scene, which took place in Argentina at a period of great turbulence in December 1989. A customer finds a good inside a shop, with a clearly marked price, and decides to buy it. The shopkeeper refuses; he explains that the posted price has no significance, because he cannot be sure that the wholesaler will not double his own price the next day. When asked what he would do if someone offered to pay double the marked price, the shopkeeper answers that he would not sell anyway, for what if the wholesale price tripled before he replaced the good? Such reactions bring to mind the 'no trade' results of Milgrom and Stokey (1982): if the seller comes to believe that the prospective buyer has better information about the inflation in prospect than he has himself, it may become impossible for the prospective buyer to come up with an unconditional bid that will be accepted. Yet, in general the disappearance of markets in very high inflations appears to stem from 'complexity avoidance' rather than from specific informational asymmetries (cf. Chapter 7).

[20] For example, Bresciani-Turroni (1937, p. 124) mentions the case of some German firms in 1923, who offered the following discounts with respect to mark prices: 20% if payment was made in gold-indexed bonds, 30% on sales in dollar bonds, and 45% if payment was made in foreign currency. At about the same time, the Hamburg authorities explicitly allowed shops to apply price surcharges of up to 30% on their sales in paper marks.

money is seen to stay in use as a medium of exchange. When stripped of its precautionary and speculative demand and with transactions balances down to a minimum, the excess demand for money can flicker between positive and negative, depending not only on the quantity that the central bank issues and on expectations, but also on the volume of transactions that are to be settled each day. These high-frequency oscillations are transmitted to the goods and foreign exchange markets very swiftly.[21]

The search for a pricing standard leads to widespread but incomplete 'dollarization' of goods prices. The move is often started by large firms selling internationally traded goods or intermediate commodities, and is transmitted 'downstream' to the markets for final goods; however, it usually does not reach the retail markets for non-durables. That firms post their prices in dollars does not mean that they keep prices constant in that unit: dollar prices too are revised very frequently and by large percentages. Thus, although the exchange rate serves as a common reference for price setting, the real exchange rate and relative prices in general exhibit wide fluctuations none the less.

In hyperinflation, the unit of account for current prices and the means of payment become more and more disassociated and neither function is performed well. The business of firms and consumers is complicated accordingly. Wage earners find it impossible to predict the purchasing power of their periodic income. When managing their monthly purchases, they have to choose between taking the loss from holding on to money for too long and running the risk of being left without enough cash to manage until the next payday. To arrange even routine payments from one firm to another becomes troublesome.[22] In such

[21] One consequence is that the exchange rate oscillates widely over very short periods. In hyperinflation, money demand no longer acts as 'shock absorber' for the period-by-period injections of money—with consequences discussed further in Chapter 7.

[22] During the Argentine hyperinflations, it was common for firms to order goods without knowing the price they would pay for them; the price would be communicated when the goods were delivered. Some transactions were settled in the following way. The price was determined as the domestic money equivalent of a dollar price. Upon delivery, the seller received a check for an amount

circumstances, trade credit vanishes completely for all practical purposes and sellers refuse to grant even the simplest forms of credit to consumers. With money on the edge of becoming valueless, people more often find themselves cash-constrained. Sellers are without incentives to supply goods to the market. While the effect that milder forms of high inflation have on output is hard to measure precisely, hyperinflation brings on a depression in real activity.[23]

At the root of hyperinflation lies the inability of the government to provide a monetary instrument that people can confidently use. Good substitutes for working monetary institutions that will permit the private sector 'to go about its business' simply do not emerge spontaneously. At the same time, hyperinflation disrupts the operation of the State itself as all sources of funds for the government dry up. Hyperinflation 'cuts the size of the public sector' in the most destructive way: even the most elementary activities of government are carried out, if at all, with great difficulty. When the government comes to depend on worthless paper to maintain the loyalty of public servants, the State is in great danger.

Hyperinflations therefore cannot be sustained for long. When a society has reached this extreme, the alternatives become stark and simple: Stabilize or else![24]

based on the exchange rate of that moment. When the check was credited, the price was recalculated, taking into account the movement of the exchange rate during the interval; the buyer then issued a check for the difference between that price and his original payment. But his check also took time to clear, which motivated a new round of recalculation and payment. A single transaction could result in several iterations of this type.

[23] Good data on output are lacking for the European episodes of the 1920s. In the German case, it is clear that industrial production reached a well defined trough in the hyperinflation year of 1923, and that in the period of most rapid inflation, unemployment was very high. Contemporary observers debated whether inflation had been detrimental to production until it reached hyperinflation levels, but: 'there is a unanimous opinion that in the final phases of the German inflation, the depreciation of money was, to say the least, a discouragement for productive effort' (Graham 1930, p. 320). The Latin American hyperinflations of the 1980s generally saw aggregate output plunge sharply.

[24] Bernholz (1989) arrives at the same conclusion: 'we have to expect that each hyperinflation leads to attempts at currency reform. Historically this has been true for all hyperinflations until 1985.'

6
Stabilization: Finding a Way Back

Stabilization programmes have to fit the type of inflation they confront. If the inflation is moderate, policy-makers usually rely on a gradual correction of monetary policies to bring about the desired disinflation. This need not involve any major changes in other instruments. One attempts to minimize the disruption of the plans of individual agents. High inflations, in contrast, are attacked with far more comprehensive policy 'packages' that aim to force a sudden change in modes of behaviour that the inflation has induced. These programmes typically announce large-scale policy reforms with significant distributive consequences. They never lack for political drama, therefore.

High inflations are unpopular. Governments have the incentive to bring them to an end and to do it quickly. But motivation must be translated into concrete actions. What makes a serious stabilization effort politically feasible is a question that we are not prepared to tackle. But the basic economic prerequisites for success are reasonably simple—or so they appear from a safe distance at least. First and foremost, the government must gain control over its fiscal policies so as to reduce drastically its dependence on the inflation tax. This is a necessary condition for a disinflation to last. Moreover, when the public recognizes that the government can manage its affairs over time without relying on monetary financing, a rapid disinflation becomes far easier to bring about and to maintain (cf. Sargent 1982).

However, a stabilization process will not just unfold as a predetermined programme wherein the actions of the government and the reactions of the public are constantly well matched. The transition out of high inflation confronts both the authorities and private agents with frequent choices for which they do not have ready-made solutions. Policy-makers find that they cannot