

Exchange Rate Appreciation and Negative Central Bank Capital: Is There a Problem?

Jan Frait – Board Member, Czech National Bank¹

1. The Czech National Bank and its balance sheet

The Czech National Bank (CNB) is one of the central banks that have negative own capital. This particular situation is the result of both historical and ongoing events and processes. The CNB was created in 1993 with a low capital base. Subsequent profits were spent in the 1990s on programs aimed at stabilizing and consolidating the banking sector. In addition, the CNB accumulated relatively high foreign exchange reserves, initially due to capital inflows during the period of the fixed exchange rate regime, and later in an effort to prevent excessive exchange rate appreciation (mainly due to privatization-related inflows). There were significant costs associated with the sterilization of these reserve inflows (as the interest paid on sterilization operations exceeded that received on foreign exchange reserve holdings). Both these sources of losses disappeared at the end of the decade.

Table 1: Factors behind the CNB's profits and losses (bn CZK)

	Sterilization costs (repos) ²	Interest on FX reserves	Banking sector stabilization costs	FX reserves valuation profits	Financial outcome without FX reserves valuation
1993	-1.31	1.69	-1.50	-1.86	3.64
1994	-6.55	2.51	-1.45	1.54	-0.10
1995	-6.30	13.60	-4.60	1.00	0.00
1996	-11.50	13.60	-3.63	-8.34	-0.31
1997	-11.97	12.76	-35.63	44.65	-33.90
1998	-20.34	13.95	-27.36	-35.61	-15.13
1999	-14.37	14.79	-1.32	31.52	0.87
2000	-13.99	21.87	-1.27	-3.52	6.04
2001	-15.82	28.52	0.54	-40.12	11.49
2002	-15.91	27.29	0.76	-26.15	16.68
2003	-12.13	24.97	0.82	-29.77	11.60
2004	-11.17	19.33	0.88	-61.14	7.42
Total	-141.36	194.88	-73.76	-127.80	8.29

Source: CNB

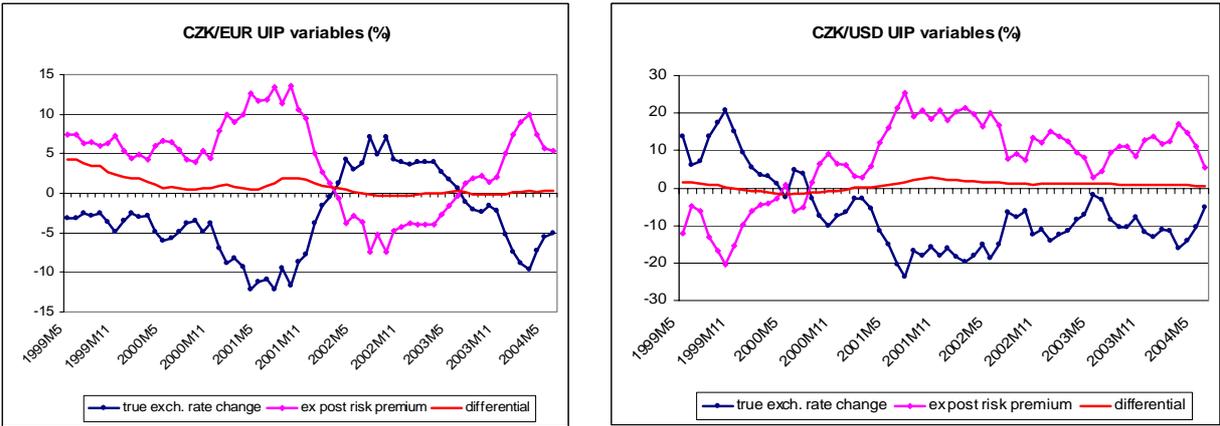
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² Sterilization costs include interest paid on CNB bills used in repo operations (from 1995 up to now) and interest paid on CNB bills issued in 1993–1994. Since 2001 the costs also include interest paid on minimum reserve requirements.

The exchange rate changes during the 1990s produced relatively large losses and profits, but the overall result was nevertheless positive. However, after inflation was stabilized at the end of the 1990s, the domestic currency started to appreciate continuously in nominal terms. This manifested itself in sizeable valuation losses on foreign exchange reserve holdings. At the end of 2004, the accumulated loss exceeded 4 bn EUR (126 bn CZK) and moved the CNB's capital to negative levels close to the accumulated loss. Since 2000, the financial outcome of the CNB's operations has always been positive, if one abstracts from valuation losses (see Table 1). These losses are thus currently the only source of the deepening of the CNB's negative capital. Despite a fairly positive financial outcome in the first half of 2005, the negative capital may even deepen further in the years ahead, owing to continuation of the nominal exchange rate appreciation. This has prompted questions such as whether or not the negative capital is a problem, whether the losses can be offset by future profits, and under what conditions should the government step in.

The recent developments are associated with convergence-linked dynamics. With low inflation and a trend of equilibrium real exchange rate appreciation, some nominal exchange rate appreciation must be allowed for. Between 1993 and July 2005, the koruna appreciated in nominal terms against both the euro and the dollar by roughly 15 percent. Given the level of the CNB's inflation target, some nominal exchange rate appreciation cannot be ruled out in the next few years. This creates potential for some further valuation losses. The literature often associates such losses with a relatively high risk premium on domestic assets implied by a lack of domestic policy credibility. The Czech Republic's case, however, is not so easy to include in such a category. The positive *ex post* risk premium is not a result of a positive interest rate differential. This has been close to zero, and sometimes even negative, for several years. The *ex post* risk premium has become positive solely because of the nominal exchange rate appreciation. Of course, it can be argued that, given the convergence-linked trends, Czech interest rates should be even lower, which would reduce the risk premia further. That would nevertheless require policy rates close to zero, with potential risks to financial stability and intertemporal equilibrium.

Figure 1: Risk premia and interest rate differentials



Source: own calculations based on data from IMF-IFS, Bloomberg and the CNB's ARAD

Growth in foreign exchange reserve holdings has been identified as the major source of the accumulated loss. Official interventions were previously an important factor behind the growth in reserves. However, the last intervention episode occurred in 2002. The major factor in recent years thus lies in direct purchases of government funds from privatization sales of

national property to foreign investors. One also cannot ignore the interest accrued. Given that there is still some property left for privatization to foreign investors and that purchases of some other official flows cannot be excluded, the size of the reserves and the potential for valuation losses may increase further. Table 2 shows that the foreign exchange reserve portfolio is the dominant component of the CNB's balance sheet (25 bn EUR, i.e. 30 bn USD, at the end of June 2005). A roughly 60 percent share is allocated in EUR, and the rest in USD (which implies huge valuation losses linked to the dollar depreciation during 2004).

Table 2: Selected items in the CNB's balance sheet (end-June 2005)

assets			liabilities		
total	870		total	870	
FX assets	794	91%	currency	276	32%
other	76	9%	CNB bills	488	56%
			other	201	
			loss	-125	
			2005 profit	30	

Source: CNB

The CNB's balance sheet and potential for future profitability will be significantly affected by future membership in the euro area. The major part of the reserves will turn into domestic currency assets. With the exchange rate between the koruna and the euro irrevocably "fixed", the main factor underlying the losses will disappear. The future financial position of the CNB thus depends strongly on the level of the unrealized loss as of the euro area entry date. Given the uncertainty regarding that date, it is difficult to estimate it (the current working date is the beginning of 2010).

2. Central bank net worth in the literature

This section refers to several papers and other documents dealing with the issue of negative central bank capital. Central banks used to be a kind of money-making machine in many countries for rather a long time. The level of profits recently declined with the drop in world inflation. It is now no surprise for a central bank to end up in a loss in a particular year. Some central bankers even talk about a negative inflation tax. Still, central banks should be profitable in the long run thanks to seigniorage from the right to issue currency. At the same time, measures adopted in an attempt to secure price stability or financial stability may deliver losses that could also prevail for quite a long time. These losses must be identified in the accounting and charged against capital, and the prospective impact on the value of capital must be registered in the central bank's balance sheet.

Central bank losses, and even negative own capital, is not a new topic in the literature. For years, economists from central banks and international institutions covered the issue primarily from the perspective of countries with low monetary policy credibility and central bank involvement in quasi-fiscal operations. Recently, attention has shifted to the potential impact of the accumulation of large foreign exchange reserves in a number of countries. Central banks in different countries are exposed to different risks as regards the effect of foreign exchange reserve holdings on their profit or loss. Those central banks which merely manage the foreign exchange reserves in the role of agent of the state are not exposed to the risk of losses from exchange rate movements. By contrast, such risk is faced by those central banks which hold their nation's foreign exchange reserves and for which exchange rate movements are a significant factor affecting price stability and economic activity. Countries that attain low inflation by comparison with countries that issue reserve currencies are logically exposed

to the risk of exchange rate losses³. Those central banks which have accumulated large foreign exchange reserves and at the same time withdraw issued liquidity by means of sterilization measures are most exposed to risk. They can suffer losses not only from appreciation of their currencies, but also from the sterilization measures themselves, if their interest rates reflect a high risk premium. Such losses are then a combination of accounting losses from the revaluation of the foreign exchange reserves and operational losses. Below I provide a brief survey of the recent literature dealing with these issues. I focus primarily on the papers that pay attention to the negative capital of a central bank. More theoretical papers are listed first, papers reflecting the debate in the international institutions then follow.

Of the Czech literature, Holub (2001) studies in detail the determination of the central bank's profit. He summarizes that the profit is the higher (i) the higher is the opportunity cost seigniorage; (ii) the smaller is the risk premium on domestic assets (and the smaller are net foreign exchange reserves if the risk premium is positive); (iii) the bigger is the unexpected exchange rate depreciation in excess of what the uncovered interest rate parity counts on (and the higher are net foreign exchange reserves in this case); (iv) the less is the average interest rate on the government's debt to the central bank below the market rate (and the smaller is this debt if this applies); (v) the less is the average interest rate on other net central bank assets below the market rate (and the smaller are these assets if this applies); (vi) the higher is the net capital of the central bank; (vii) the smaller are the net operating costs of the central bank. Holub then analyzes whether or not central banks can credibly perform their policy goals with negative capital, and what happens if trust in the sustainability of the central bank's finances is lost even though its financial situation could be sustainable if confidence was preserved. He demonstrates how low credibility of the country's authorities may, via the risk premium in the foreign exchange market, reduce the ability of the central bank to generate profits⁴. He agrees that even a central bank with negative own capital could function without any direct financial problem, because, thanks to its monopoly on issuing money, it can generate positive profits even with zero own capital. The capital just should not decline below some negative critical level, i.e. the ratio of the central bank's negative own capital to the monetary base should be stabilized and should not grow without limits. In this case, the nominal monetary base grows faster than is the nominal interest rate (or, equivalently, the real monetary base grows faster than is the real interest rate); the opportunity cost of seigniorage exceeds all the central bank's explicit and implicit costs.

In a similar way, Ize (2005) provides a quantitative framework for assessing the minimum central bank capital needed to ensure the credibility of the inflation target. The calculations of capital requirements are based on operating expenditures and the carrying cost of international reserves. One of the case studies is Chile, which has a balance sheet that is not so different from the Czech one (see Table 3). In recent years, the central bank of Chile incurred losses of between 1 and 2 percent of GDP per year despite low operating expenses and relatively low risk premia. The author concludes that with a slowdown in growth of international reserves,

³ Switzerland, for example, suffered major exchange rate losses in the 1970s. As it was able to maintain its interest rates at lower levels relative to the reserve currencies in the long term, it gradually covered the losses from interest income.

⁴ He also shows that the risk-premium effect may also mean that there is not a simple relationship between inflation and the central bank's profits for reasonably low levels of inflation. Higher inflation increases the nominal interest rate and thus raises the opportunity cost of seigniorage. But if we assume that the equilibrium risk premium may be positively related to the level of inflation (or to its variability, which is empirically closely correlated with the average rate of inflation), higher inflation may at the same time mean a higher "risk premium cost". In some special cases (i.e., with very high net foreign exchange assets), the latter effect can dominate, meaning that the central bank's profits can in fact go down with an increase in inflation.

the losses can turn into profits in the long run. However, avoiding recapitalization on the grounds that the expected future profits will offset the immediate losses may be problematic.

Bindseil, Manzanares, and Weller (2004) present a model in which central banks always return to profitability in the long run, regardless of the starting levels of operating costs and capital. They show that under some conditions a low (or even negative) level of capital would not have harmful effects on the ability of the central bank to achieve its monetary policy target. A temporary shock creating negative capital and a loss-making situation is always reversed in the long run, with the central bank returning to profitability and a positive level of capital. There are two exceptions: when the economy falls into a deflationary trap, from which it is not possible to escape; and, second, when the growth rate of the demand for banknotes falls short of nominal interest rates. However, they admit that there may be another set of factors, related to the institutional environment in which the central bank exists, that is causing a relationship between the weakness in the central bank's financial position and its inability to control inflation. Even if a central bank is not subject to liquidity constraints, credibility is indeed positively correlated with the level of capital when some extensions to the model are included, allowing some degree of concern about the profit and loss account to affect the central bank's interest rate setting behavior. Positive capital thus seems to remain a key tool to ensure that independent central bankers always concentrate on price stability in their monetary policy decisions.

There are a few papers relevant to understanding the IMF's position on the issue. Stella (1997) finds that though central bank capital as conventionally defined is not strictly necessary, a weak central bank balance sheet leads to chronic losses, an abandonment of price stability as the primary policy goal, a decline in central bank independence, and the imposition of inefficient restrictions on the financial system. He concludes that if society values an operationally independent central bank, the transfer of real resources to recapitalize the central bank becomes necessary when the losses are sizeable. In a more recent paper, Stella (2002) concludes that the central bank is financially strong if it possesses resources sufficient to attain its fundamental policy objectives. A strong, clean balance sheet heightens the chance that an independent central bank will be able to successfully implement policy, but also that variations in its financial results will broadly affect the direct costs and benefits of the policy it undertakes. If credibility is important for the success of the policy, the central bank must be financially strong. A weak central bank will make losses, which, if they reach sufficient magnitude, will necessitate financing through current or future money creation, thereby undermining monetary and exchange rate policies. Loss-making central banks should be recapitalized with equity transfusions from the government. The equity infusion should take the form of interest-bearing marketable government debt that eventually could be exchanged for loss-generating central bank liabilities or otherwise used to cover the losses.

Dalton and Dziobek (2005) warn that failure to address ongoing losses, or any ensuing negative net worth⁵, will interfere with monetary management and may jeopardize a central bank's independence and credibility. Where central bank losses give rise to negative net worth, IMF recommended practice⁶ is for the government to recapitalize the bank by an injection of either cash or government securities bearing interest at market-related rates. Payments received on these securities will serve as a source of income that may be allocated

⁵ The terms "net worth" and "capital" are often understood as synonymous to the context. However, Peter Stella and other experts in the field cast doubt on this approach. It is more appropriate to use "capital" in the accounting sense and "net worth" in the economic sense. Net worth thus should be understood as a sum of discounted expected future earnings of the central bank.

⁶ Model central bank law as recommended by the IMF provides that in the case of negative central bank net worth the government should issue to the central bank securities that bear interest at market-related rates.

toward redemption or amortization of the underlying government securities. This process restores the solvency of the central bank, and, at the same time, provides earnings to cover normal operating expenses.

BIS (2005) paper⁷ assumes that a variety of institutional arrangements can be used to ensure that the central bank has sufficient financial independence. Holding sufficient capital is only one of them. One can thus imagine a central bank working well with negative capital. If a central bank suffers substantial losses for an extended period of time, it may become a serious problem. Assuming that central banks generally do not want to abandon their price stability objective, to resort to financial repression, or to rely on frequent rescue by the government, a recapitalization scheme becomes necessary. A recapitalization should be more than a mere accounting operation between the two entities. Full recapitalization should involve a transfer of real resources from the government to the central bank so that the latter can again be profitable and its balance sheet remains sound. A transfer of resources from the government in the form of a non-marketable and non-interest bearing asset (e.g. an unremunerated book claim shown in the balance sheet of the central bank) would provide no assistance to the central bank because it would carry no economic value⁸. The most practical route for a capital infusion would thus be for the government to provide the central bank with interest-bearing marketable government securities. This is tantamount to internalizing the fiscal impact of the central bank's financial condition in the national budget.

To summarize, the general message of the above listed literature is that a central bank may work well even with negative capital. Due to its position in the financial system, even a central bank with negative capital could function without any liquidity problems. Moreover, as the issuer of the currency, the central bank has substantial non-interest bearing liabilities (primarily currency) that enable it to generate profits and have a positive economic value even with negative capital. To sum up, negative capital on its own is neither a signal of potential illiquidity, nor a signal of insolvency. Nevertheless, positive capital is highly recommended due to the risks implied. For a central bank that is perceived by markets financially weak can be rather difficult to backstop the financial system if adversely affected by a major shock. Weak balance sheet may also reduce financial independence due to the doubts about ability of a central bank to withstand further shocks without recourse to public finances. Low degree of financial strength may then reduce credibility of a central bank as to meeting its policy objectives. Some authors therefore claim that the central bank should always have positive capital and seek government assistance soon enough if some losses occur.

I can see a few problems with some of the recommendations. The first weakness I found in some of the papers is that their conclusions are based on a vague line of reasoning and missing explanations. They speak of a central bank with financial difficulties or an unsustainable financial position, or a potential financial collapse of the central bank, without explicitly saying what these terms mean. The other problem is that most of the papers base their recommendations on the study of countries with fragile financial systems and low policy credibility. They ignore the cases in which the negative capital is brought about by valuation losses only. The recommendations are thus excessively generalizing. However, it is obvious that losses due to operating expenses are crucially different from valuation losses. They should therefore be treated separately.

⁷ So far, the paper has been made available to the central banking community only, not to the general public.

⁸ Even if the asset is an interest-bearing claim against the government, if the interest is merely capitalized by the central bank and hence does not result in a reduction in the central bank's monetary liabilities, it would provide no relief. Both approaches would simply render explicit what is already provided by the government as an implicit guarantee, and the value added for the central bank would be quite limited.

The third problem is that some of the recommendations for recapitalization ignore practical aspects of the issue, especially the timing of the whole process. If the central bank balance sheet deviates from the optimum in this respect, it may not be a fatal problem requiring an immediate solution. In fact, it is a very complicated issue to answer how the balance sheet of the central bank can be adjusted if it deviates from the optimal structure. A gradual approach which would not compromise the monetary policy goals and independence of the central bank may be appropriate.

3. What kind of solution for the CNB?

Now we can come back to the discussion of the CNB's negative capital, its implications, and potential solutions. The first question we have to answer is whether the CNB's negative capital constitutes a major economic challenge to current policies? As I have already said, the seriousness and potential consequences of negative capital of the central bank depend on the source of the underlying losses. Thanks to the fact that the only source of CNB's losses in the last few years has been revaluations of foreign exchange reserves, we can ignore other sources effective in the past. With this assumption in mind, we can ascertain that the negative capital of the CNB is hardly a major obstacle to its current operations.

A central bank is an issuer of legal tender and thus can always repay its debt in the national currency by issuing new liabilities. Furthermore, the losses have not created any additional liquidity and hence have not generated any potential inflation pressures⁹. It would hardly be appropriate to label the negative own capital as a "debt", since it is the amount that the CNB owes itself. To sum up, negative capital is neither a signal of potential illiquidity nor a signal of insolvency, unless it reaches extremely high levels. Consequently, the accumulated loss cannot undermine the credibility of the CNB's monetary policy. On the contrary, the losses seem to be a consequence of high CNB's credibility. It is practically impossible to imagine how the financial position of the CNB could lead to a financial crisis. After all, if the losses initiated a crisis, the ensuing intervention to moderate the depreciation would have the salutary benefit of improving the central bank's financial condition. In the extreme case, the Czech currency would depreciate to such a level that the problem – negative capital – would completely disappear.

The negative capital of the CNB currently clearly has no impact on the credibility of the CNB's monetary policy in reality, either. In this respect the CNB is in a position similar to the central bank of Chile, which is often cited as a successful central bank with negative capital. The indicators in Table 3 document that the central bank of Chile may even be in a more complicated position than the CNB. The main difference is that in the case of the Czech Republic, sterilization is much lower than foreign exchange reserves.

Table 3: Selected indicators as ratio to currency in circulation

	Chile (end 2003)	Czech Rep. (end 2004)
issued debt (sterilization)	6.3	1.7
total balance sheet	7.6	2.8

⁹ The loss is not creating any additional liquidity feeding through to growth in the money stock and generating potential inflation pressures. The loss arises from the fact that years ago the CNB bought one euro for, say, 35 korunas and that euro now has a value of just 30 korunas. Nevertheless, the 35 korunas used to buy that euro were issued years ago and the change in its value no longer affects the quantity of korunas in circulation. By contrast, if the accumulated loss were to grow, for example, as a result of quasi-fiscal operations resulting in the issuance of new liquidity, it would be a major obstacle to the attainment of price stability. But this has not happened in the Czech Republic in years.

FX reserves	4.4	2.5
operating expenses (%)	1.2	0.85

Source: CNB and Bank of Chile Annual Report

Should the CNB seek the assistance of the government in solving the “problem”, or can future profits of the CNB do the job¹⁰? My recommendation stems from the fact that the necessity of a governmental injection of funds (cash or marketable interest-bearing bonds that could be exchanged for the loss-generating liabilities) crucially depends on the structure of the balance sheet and its future prospects¹¹. Even a sizeable accumulated loss does not automatically require this kind of injection. My view is that in the case of negative capital emerging solely due to valuation losses, a transfer of real resources from the government is exactly the kind of measure that will reduce central bank independence. That is why I recommend, in this particular case, to rely first on the central bank’s future profits to offset the past losses, provided, of course, that one is sure that the central bank has the potential to make profits in the years ahead. As I explained above, the CNB is in such a position. The CNB in its communication with the government and the public therefore asserts that the current accumulated loss can be covered by future profits¹².

The CNB’s simulations¹³ show that interest income (given by higher interest received on FX reserves compared to that paid on CNB bills) and growth in currency share will turn the financial outcomes from losses to profits in the future. In the long run, these profits will eventually offset the accumulated loss from the previous periods. This is a just a natural reflection of the fact that as issuer of the currency, the central bank has substantial non-interest bearing liabilities (primarily currency) that enable it to generate profits and have a positive economic value even with negative capital. In other words, a central bank with a high negative capital may have a very high positive net worth (defined as a sum of discounted expected future earnings). This kind of logic applies also to a private firm. It is the value of the firm what matters, not the actual capital.

The major factor behind the projection is growth in currency at the expense of liquidity sterilized by issuing CNB bills¹⁴ (in the next few years the currency should go up by 0.7–0.9 bn EUR a year). The ratio of interest-bearing assets to interest-free liabilities will start to grow. One of the crucial assumptions is that the nominal appreciation of the domestic currency will not continue forever, not only thanks to euro adoption, but also due to natural economic forces. The simulations show that further losses can be expected to prevail in the next few years, but even under relatively pessimistic scenarios the profits should then eliminate the accumulated loss 15 to 20 years from now. This applies if we rule out any further quasi-fiscal cost paid by the CNB, including bank bail-outs, a dramatic drop in the

¹⁰ There is a belief that negative own capital will have to be eliminated before we join the euro area. However, not a single document of the ESCB or any other institution says this. Besides, it would not be appropriate to try to deal with the issue now, since the forecast of the accounting loss as of the euro adoption date is subject to major uncertainty.

¹¹ In the case of the CNB the problem may not be loss-generating central bank liabilities. The source of loss comes from the asset side of the balance sheet or from the specific “convergence” structure of the balance sheet.

¹² This is supported by legislation guaranteeing that the central bank is not required to transfer profits to the government unless it has fully covered the losses from previous years.

¹³ The simulations were carried out under realistic assumptions concerning growth in the ratio of currency to nominal product, the growth rate of nominal product, the nominal exchange rate trajectory, the operating costs of the CNB, an increase in FX reserves and sterilization or seigniorage sharing with the ECB.

¹⁴ The CNB currently sterilizes a vast amount of excess liquidity by withdrawing approximately 15 bn EUR from the market daily through its repo operations. Nevertheless, the interest income on the foreign exchange reserves now exceeds the interest costs of sterilization.

growth rate of currency and an extreme increase in the loss due to sharp appreciation of the nominal exchange rate.

Of course, one cannot rule out shocks, structural shifts or other events that would shift the outcomes to even deeper losses. This does not, however, affect the key message that in the long run the CNB can eliminate its negative capital without a recapitalization based on government funds, and the current negative own capital should not constitute a fundamental constraint on its operations. However, if negative capital were seen as a major problem, a non-interest bearing bond (such as a perpetuity) would be a satisfactory solution¹⁵. The situation would probably change if, for some specific reasons, the sterilization exceeded the value of the FX reserves, the accumulated loss exceeded the volume of currency or a very pessimistic outlook for the future emerged. In this situation, discussion of the other method of recapitalization might become relevant.

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¹⁵ Nevertheless, I can understand that the injection of a non-interest bearing bond could be objected to on the grounds of the accounting rules or auditing standards. But this is a subject for a different debate.