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Abstract

A small analytic framework is build to analyse the relation between reserve requirements, inflation, and seigniorage revenues. From the analysis we can derive steady-state seigniorage revenues as a function of the rate of inflation and the intensity of financial repression. The framework is applied to the case of Poland that has undertaken a rapid transition to a market economy and implemented a substantial financial sector reform.

Keywords
Financial repression, economies in transition, monetary policy, seigniorage

JEL-Classifications
E31, E41, E52

Comments

Introduction

An important element in the transformation process in Eastern Europe is the reform of the financial sector. Clearly, the functioning and structure of the financial sector had to change drastically with the move from a planned economy to a market-based economy. In the planned economy payment flows, financial intermediation, credit allocation, currency issuance, foreign exchange and banking regulation and supervision were all performed by the mono State bank, whereas in a market economy such different functions are typically decentralized with different institutions. A detailed analysis of the financial sector reform in Eastern Europe is found in Catte and Mastropasqua (1993), Bonin (1993) and Thorne (1993).

Government control of the financial sector has typically been high in developing and transforming economies and the reliance on revenues from repression of the domestic financial system is often considerable. The revenues that accrue to the government from financial repression originate from two sources: firstly, interest rate ceilings allow the government to finance its government debt at a lower interest rate. Giovannini and de Melo (1993) estimate the revenues from this type of financial repression for 24 developing countries and that revenues in some cases can be as high 3% of GDP. Molho (1992) considers the case of Italy.

Secondly, a system of reserve requirements on deposits increases the amount of base money and by that seigniorage revenues. Theoretical models on the role of reserve requirements in public finance are found in Brock (1984) and (1989), Freeman (1987), Mormouras and Russell (1992), Bachetta and Caminal (1992) and Espinosa-Vega (1995). Roubini and Sala-I-Martin (1992) and Demetriades and Luintel (1994) analyse the relation between financial repression and economic growth in developing countries.

Apart from reserve requirements, inefficiencies and delays in the payments system force the banking and financial sector to hold a larger amount of reserve money than it otherwise would. In our analysis such involuntary held excess reserves are considered to be part of the financial repression by the monetary authorities, as their consequences on seigniorage are similar to those of reserve requirements. "Float" balances held at the central bank because of inefficiencies in the payments systems have amounted up to 15% of reserve money in Eastern Europe. Folkerts-Landau e.a. (1993) and Balino e.a. (1994) analyse the inefficiencies in the payments systems in Eastern Europe and consider the scope for reforming payments systems.

Aim of this paper is to apply the theoretical insights from the financial repression literature to an empirical example, namely Poland, that has undertaken a substantial financial liberalization. We concentrate on the second instrument of financial repression, reserve requirements cum "float" balances, as (domestically owned) government debt has been small until recently because of the small size of domestic capital markets.

The design, implementation and results from the economic reform process in Poland has been the subject of a considerable number of studies, among which the studies by Nuti (1990), Calvo and Coricelli (1992), Sachs (1993), Lane (1994), Berg (1994) and Blanchard (1994) are prominent examples. Most important elements in the reform were liberalization of prices, privatization of state enterprises, restoring of internal and external convertibility of the Zloty, foreign trade liberalization and a fiscal and monetary contraction to achieve macroeconomic stabilization.

During the 1980's Poland implemented some small but steady reforms in its financial sector in an attempt to reduce the most obvious distortions. In particularly bureaucracy and the lack of financial discipline of state enterprises resulting in 'soft budget constraints' was attacked. In 1989 the mono State bank was dissolved into 9 commercial banks that were each operating in a particular region. The major reform of the financial sector followed with the jump on the path of transition towards a market economy with the Polish 'Big Bang' of 1990. It established a free banking system, privatization of the state-owned enterprises in the financial sector, internal and external convertibility of the Zloty and a strong reduction from the direct intervention by the State in the financial sector.

As in the other Eastern European countries, reform of the Polish financial sector has been hindered initially by (a) an inadequate and inefficient payments system -resulting in float-, (b) the large amount of non or ill-performing loans that were made to (former) state-owned companies, (c) inadequate regulation and supervision by the monetary authorities, (d) a lack of experienced and trained workers in the financial sector.

During 1991 and 1992 a new body of regulatory and supervisory legislation was introduced to further strengthen the institutional framework of the financial markets. Included were amendments to establish a more independent Central Bank, a system of minimum capital requirements, capital adequacy ratios, restrictions on exposure and bankruptcy procedures. Deposit insurance is, however, still prevented because of the large amount of non-performing loans that still exist in the financial sector. Measures to reform the payments system, to stimulate

money market development and recapitalization of banks using fiscal resources are other important elements of the financial sector reform.

Section 2 develops a small analytical model of financial repression, seigniorage and financial sector reform. The seigniorage Laffer curve describes the relation between seigniorage, inflation and financial repression. The effect of a change in financial repression on the seigniorage Laffer curve are examined. Our analytical model is inspired by the important contribution of Brock (1989) on reserve requirements and seigniorage. Section 3 applies the analytical apparatus developed in section 2 to the case of Poland. The Polish demand for currency and deposits is estimated and discussed and the parameter estimates are used to serve as inputs to derive the seigniorage Laffer curve.

2. A Model of Financial Repression and Seigniorage

In this section we analyse the consequences of a system of reserve requirements that authorities impose on the domestic financial sector. Reserve requirements viz. financial repression here are defined as the effective reserve requirement rather than statutory reserve requirements since we want to include the "float" balances that the banking sector holds with the monetary authorities because of inefficient payment systems. In this manner we are able to concentrate on the actual fiscal revenues that financial repression provides.

Reserve requirements imply that the amount of base money, H, is held artificially high, thus enlarging seigniorage revenues[1]. Base money equals currency in circulation, C, plus reserve money, which equals the reserve requirements, τ_j, times the different types of deposits, D_j:

$$H = C + \sum_j \tau_j D_j \qquad (1)$$

Real seigniorage revenues are defined as the change in real base money. According to (1),

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[1] This argument stresses the revenue motive underlying reserve requirements. Other motives that are sometimes distinguished are (i) its use as a monetary policy instrument, (ii) reserve money is a primary source of liquidity for the domestic money market, (iii) the seigniorage from reserve requirements could be considered as a renumeration of the services of the Central Bank provided to the banking sector.

seigniorage revenues come from two sources, from the increase in currency in circulation and from an increase in banking reserves, either due an increase in reserve requirements or an increase in deposits. Real seigniorage revenues, s, are equal to the product of the rate of base money growth, $\mu \equiv (1/H)(dH/dt)$, times the stock of real base money, $h \equiv H/P$, where P denotes the price level and t time[2]. μ is controlled by the monetary authorities.

Assume that economic agents have two alternatives to perform transactions and to store wealth: currency or deposits in domestic currency[3] that yield a nominal return of i_D. Deposits are subject to a uniform reserve requirement, τ. With competitive banking the deposit rate will equal one minus the reserve requirement times the nominal (borrowing) rate of interest i, implying that $i_D = (1-\tau)i$. τi acts as an implicit tax on financial intermediation by the banking industry[4]. The nominal deposit rate equals the real deposit rate, r_D, minus the rate of inflation, i.e. $i_D = r_D + \pi$. The real deposit rate can be rewritten as a function of reserve requirements, the real interest rate in the economy, r, and the rate of inflation: $r_D = (1-\tau)r - \tau\pi$. For simplicity we assume that the real interest rate is constant and equal to the rate of time preference. In steady-state the rate of inflation equals the rate of base money growth minus real output growth, $g \equiv dY/dt$, i.e. $\pi = \mu - g$.

Demand for currency and deposits could be derived by solving the underlying optimization problem of the representative agent. Agents will use the different characteristics of both monies to determine the optimal demand for both monies as a function of the transactions motive and the store of value motive. Such a derivation of demand for currency and deposits from microeconomic principles is found in Brock (1989) who uses the "shopping time" approach.

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[2] This follows since

$$s = \frac{dH}{dt}\frac{1}{P} = \frac{dH}{dt}\frac{1}{H}\frac{H}{P} = \mu h$$

[3] In van Aarle and Budina (1995) we investigate the demand for foreign currency deposits in Eastern Europe. We found a significant impact from such currency substitution on Polish money demand and by that on seigniorage during the transition period.

[4] See in particularly Brock (1989) in this respect. The assumption of a competitive financial sector is clearly rather odd in the case of Poland before 1990. With a government controlled monopoly in financial intermediation, however, the outcome of perfect competition could be replicated by implementing such a wedge between lending and borrowing interest rates. Fry (1981) discusses government monopoly in the financial sector. Siegel (1981) compares seigniorage from a competitive financial sector with a monopolized financial sector.

Other approaches are those based on cash-in-advance constraints (Bachetta and Caminal (1992)), and currency and deposits in the utility function (Romer (1985)).

The standard log-linear macroeconomic demand functions for currency and deposits that we will assume throughout our analysis can be considered as special cases of such microeconomic money demand theories. Demand for real currency, $c \equiv C/P$, is assumed to be a log-linear function of real income, $y \equiv Y/P$, because of the transactions motive, and the (borrowing) rate of interest, i, which measures the opportunity costs of holding currency. Demand for real deposits, $d \equiv D/P$, is also positively related to income and negatively to its opportunity costs which equal the nominal rate of interest minus the nominal deposit rate, $i - i_d$:

$$\ln(c) = \alpha_c \ln(y) - \beta_c i$$
$$\ln(d) = \alpha_d \ln(y) - \beta_d (i - i_d) \tag{2}$$

α_i and β_i are the respective income and interest semi-elasticities.

Combining (1) and (2) -and using the implication of a competitive banking sector that sets $i - i_d$ equal to τi- we can write steady-state seigniorage revenues, $s \equiv \mu h$, as the following exponential function of the rate of money growth and financial repression:

$$s \equiv \mu h = \mu \left(e^{\alpha_c \ln(y) - \beta_c (r + \mu - g)} + \tau e^{\alpha_d \ln(y) + \beta_d \tau (r + \mu - g)} \right) \tag{3}$$

The demand for base money is a function of the interest rate viz. inflation and seigniorage revenues therefore display the well-known Laffer curve property: if inflation increases seigniorage revenues first increase. If inflation is increased beyond the seigniorage maximizing rate of inflation, a further increase in inflation reduces seigniorage revenues.

The rate of money growth that maximizes steady-state seigniorage is found when differentiating (3) w.r.t. μ:

$$\frac{\partial s}{\partial \mu} = 0 \quad \Leftrightarrow \quad (1 - \beta_c \mu)c + \tau(1 + \beta_d \mu)d = 0$$
$$\Leftrightarrow \quad \mu = \frac{1}{\beta_c} + \frac{\beta_d \tau d}{\beta_c c}\left[\frac{1}{\beta_d} - \tau \mu\right] \tag{4}$$

The effective reserve requirement that maximizes steady-state seigniorage on its turn is found when differentiating (3) w.r.t. τ:

$$\frac{\partial s}{\partial \tau}=0 \quad \leftrightarrow \quad (1-\beta_d(r+\mu-g)\tau)\mu d=0$$

$$\leftrightarrow \quad \tau(r+\mu-g)=\frac{1}{\beta_d}$$

(5)

If both the rate of money growth and the effective reserve requirement are targeted such as to maximize seigniorage revenues and if we assume for simplicity in the remainder that $r=g$[5], we find $\mu^*=1/\beta_c$ and $\tau^*=\beta_c/\beta_d$. In the next section, we derive empirical estimates for the interest elasticities in case of Poland and use to estimates to calculate the seigniorage maximizing combination $\{\mu^*,\tau^*\}$.

In case of unitary income elasticities, i.e. $\alpha_m=\alpha_d=1$, seigniorage revenues as a fraction of output, s/y, are independent of the level of output. If α_c and α_d are larger than one, seigniorage revenues increase more than proportional to output.

3. Empirical Evidence on Financial Repression and Seigniorage in Poland

Financial repression of the financial sector by the monetary authorities has been substantial in the case of Poland. Table 1 calculates the Polish rate of base money growth, μ, inflation, π, effective reserve requirement, τ, total seigniorage revenues, s_T, which can be split up into seigniorage revenues from currency in circulation, s_C, and seigniorage revenues due to reserve requirements and float, s_R.

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[5] Without this assumption, the pair $\{\mu^*, \tau^*\}$ has to be found from solving the following combination of non-linear optimality conditions:

$$\mu^*=\frac{1}{\beta_c}+\frac{(r-g)d}{(r+\mu^*-g)^2\beta_c\beta_d m}$$

$$\tau^*=\frac{1}{\beta_d(r+\mu^*-g)}$$

Table 1: Reserve requirements and seigniorage in Poland

	'89	'90	'91	'92	'93	'94
μ	177%	97%	22%	31%	7%	20%
π	201%	118%	47%	35%	29%	28%
τ	36%	31%	26%	21%	13%	11%
s_T/y	6.80%	6.73%	2.58%	3.41%	0.73%	1.72%
s_C/y	2.07%	3.66%	2.04%	1.90%	1.40%	1.09%
s_R/y	4.72%	3.07%	0.54%	1.51%	-0.68%	0.63%

Following Brock (1984) the effective reserve requirement, τ, was calculated as banking reserves over total bank deposits. Figure 1 plots the rate of inflation (left scale) and the effective reserve requirement (right scale) during the period 1987-1994. In the initial phase of the reform, inflation reached near hyperinflationary levels due to the combination of the initial monetary overhang, shortages and price liberalization. From 1991 onwards inflation stabilization was achieved. The effects of the reform in the financial sector result in a gradual reduction in the effective reserve requirement that we interpret as a measure of financial repression by the monetary authorities. According to the picture, financial repression has decreased considerably, even if we disregard the initial large drop in 1989 that can be largely attributed to the inflationary outburst inflating broad money.
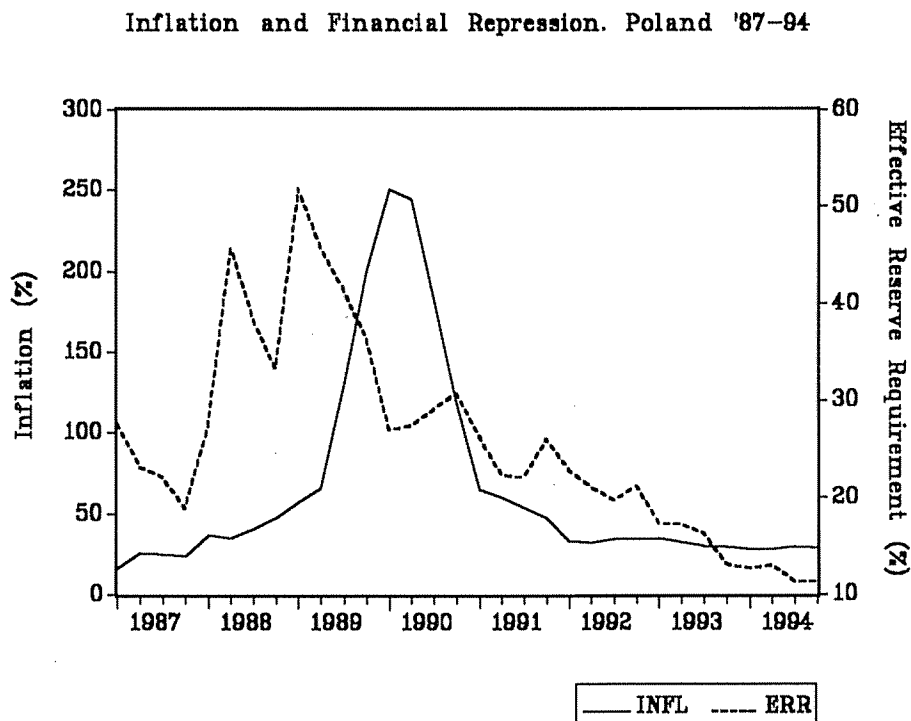
Inflation and Financial Repression. Poland '87-94

Figure 1

Figure 2 plots real currency in circulation and real deposits in Poland during the period 1986-1994 (both in logs). Deposits are the sum of demand, time, saving and foreign currency deposits held in domestic banks. The sum of time, saving and foreign currency deposits is often referred to as the stock of quasi-money (QM). Together with narrow money (M1) which consists of currency and demand deposits, quasi-money forms the stock of broad money (M2) in the economy.
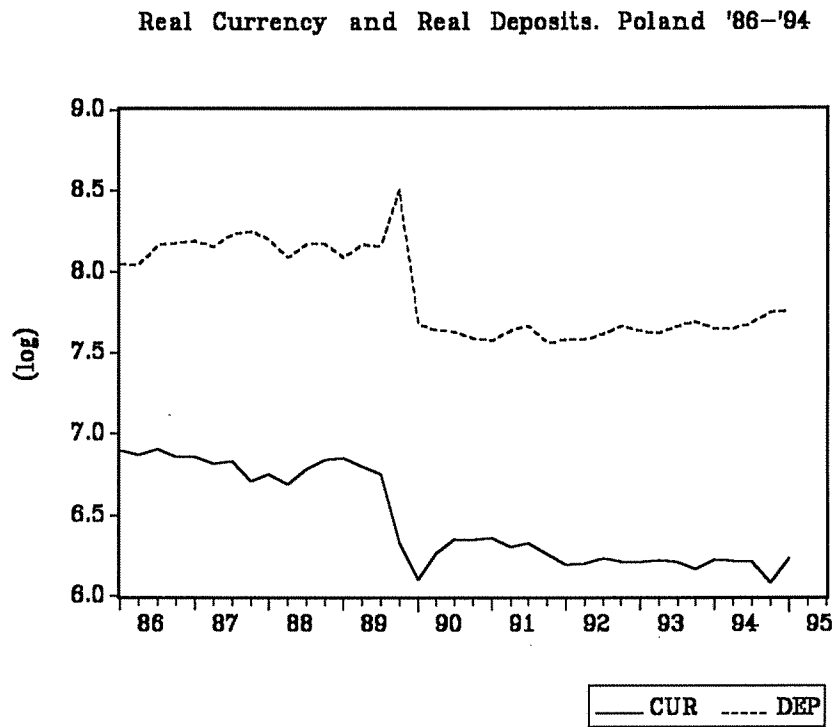
Real Currency and Real Deposits. Poland '86-'94

Figure 2

To estimate the interest elasticities of the demand for currency and deposits, we estimated the following log-linear form:

$$\ln(\frac{M}{P}) = \alpha_c \ln(y) + \beta_m i + trend + \epsilon_c$$
$$\ln(\frac{C}{P}) = \alpha_d \ln(y) + \beta_d (i - i_d) + trend + \epsilon_d$$

(6)

α_i and β_i measure the income and interest elasticities of the demand for currency and deposits. The average interest rate on deposits was used as the nominal interest rate in (10). Output was

approximated by using the index of industrial production. A trend was added to account for the impact of long-term factors, if any, that may impact on money demand. In particular, the impact of financial innovations, e.g. credit cards, cash machines etc., on money demand is sometimes introduced in the form of a trend, see e.g. Arrau e.a. (1995).

Table 2 gives the results from estimating (6).

Table 2: Estimation results (6)

	α	β	*trend*	R^2 adj.	s.e.	ADF(4)	no.obs.
c	0.84 (9.58)	-0.46 (-2.92)	-0.003 (-1.65)	0.80	0.30	-3.61 [-3.56]	37 (861:951)
d	0.86 (15.73)	-1.18 (-2.89)	0.002 (1.33)	0.85	0.28	-3.59 [-3.56]	37 (861:951)

t-statistics are given in brackets below the parameter estimates. The ADF column contains the Augmented Dickey-Fuller test (including both constant and trend) on stationarity of the OLS residuals. If the residuals are stationary, a cointegrating relation between the regression variables exist and OLS produces consistent estimates of the true parameters, despite the non-stationarity of the dependent and independent variables, as shown by Engle and Granger (1987). In both cases we indeed do not reject the hypothesis that the OLS residuals of our estimated regressions are stationary at a 95% significance level.

The small trends that we find in both cases imply that the demand for currency shifts down a little bit autonomously each year whereas deposits increase a little bit. Assuming that this is indeed due to financial innovation, the estimated trends imply a steady increase in sophistication of money services.

To test whether the estimated regression remained stable throughout the sample, we conducted a CUSUM test on structural stability of the estimated relation. Figure 3 shows the result from this test: in both cases the estimated relation has been structurally stable.
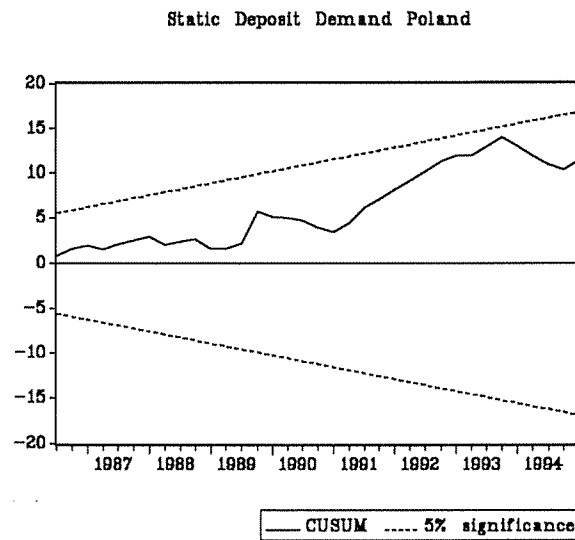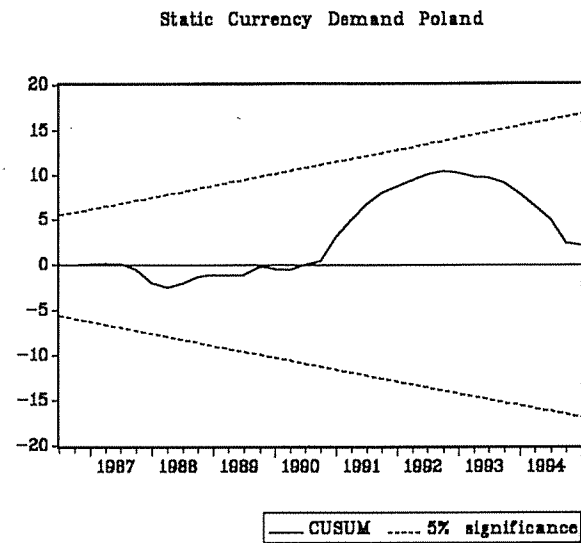
Static Currency Demand Poland

Static Deposit Demand Poland

Figure 3

The estimated parameters in table 2 of the different money demand functions enable us to draw the seigniorage Laffer curve -here using data for the year 1994-.
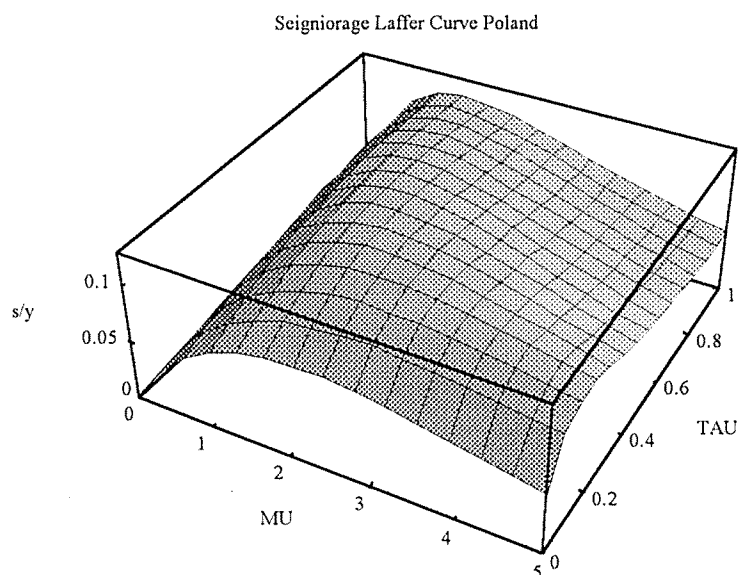
Seigniorage Laffer Curve Poland

Figure 4

The parameter estimates now allow us to calculate the combination $\{\mu^*,\tau^*\}$ that maximizes steady-state seigniorage. Using the results derived in section 2 we find $\mu^*=1/\beta_c=217\%$ and $\tau^*=\beta_c/\beta_d=39\%$. Accordingly, we conclude that Poland gradually moved away from its seigniorage maximizing combination of inflation and financial repression during the period 1989-1994.

Conclusion

Financial reform is a crucial aspect in the transition economies in Eastern Europe. In the former communist system financial intermediation, foreign exchange and payments systems were all controlled by a mono state bank acting as a direct government agent in the planning process. In a decentralized market-led economy such a structure of the financial sector is clearly inappropriate.

Poland has pursued a deliberate policy of financial sector reform since 1989. This policy has led to a strong drop in direct government intervention in financial markets. Gradually, a new institutional body of regulation and supervision is created that is better suited to establish an efficient financial sector in a market-led economy. Financial sector reform itself is likely to foster economic growth in Poland.

This paper attempted to apply some basic insight from the literature on financial repression to the process of financial sector reform in Poland. In particularly, we considered the relation between financial repression, inflation and seigniorage revenues. We discussed the effect of financial sector reform on seigniorage. After estimating demand for currency and deposits for Poland, we were able to draw the seigniorage Laffer curve. The inflation stabilization and decrease in financial repression during the period '89-'94, while beneficial in many respects, have led to a substantial reduction in seigniorage revenues accruing to the Polish government.

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