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## *Financing divided governments*

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This paper finds that when the Congress and Presidency are controlled by the different political parties in the USA the creation of the seigniorage revenue to finance spending is not higher than when those two branches are controlled by the same party. However, the hypothesis that the creation of seigniorage revenue was lower during the period when the country had a fixed exchange rate regime was partially supported.

### I. INTRODUCTION

Mankiw (1987) notes that in order to finance its spending, the government minimizes the loss generated by both tax and seigniorage revenues. Since both tax and seigniorage revenues generate inefficiencies at an increasing rate, the government faces a trade-off between these two sources of revenues. The optimum financing model suggests that the government raise both taxes and seigniorage simultaneously. In fact, Mankiw (1987), Poterba and Rotemberg (1990), and Trehan and Walsh (1990) all find a positive relationship between inflation and taxes in the USA during the post-World War II era.

The trade-off between taxation and seigniorage revenue might be influenced by two factors. These are the divided government effect on taxation and the effect of the exchange rate regime on the creation of seigniorage revenue. Regarding the first factor, Roubini and Sachs (1989a, 1989b), Andrabi (1992) and Poterba (1994) argue that divided governments are associated with higher deficits than majority governments. Changing tax laws often requires consensus among the parties sharing power in a government. Different parties view taxes on each group of goods and services differently. If the overall tax rate needs to be increased, then each party in a divided government may vote against increasing taxes on a particular good or service. Hence, divided governments cannot increase taxes as easily as majority governments. Secondly, Burdekin (1991) and Cukierman (1992) note that the optimum seigniorage revenue is affected by the exchange rate regime. Seigniorage revenue causes inflation and when a country has a fixed exchange rate regime, inflation results in balance of payment problems. Therefore, the seigniorage revenue becomes more costly. Seigniorage revenue creation should

be lower if a country has a fixed exchange rate regime than if it has a flexible exchange rate regime. The next section presents the testable model and discusses the empirical evidence for this model. We then summarize results.

### II. THE TESTABLE MODEL AND EMPIRICAL EVIDENCE

It is assumed that a government minimizes the present value of the losses generated by taxation and seigniorage revenue.<sup>1</sup> Since both these revenues generate loss at an increasing rate, a government likes to raise these two resources together in order to finance its spending rather than relying on only one of them. This suggests that there must be a positive relationship between the tax and the seigniorage revenue. The literature on the optimum financing model uses inflation as a proxy for seigniorage revenue (Mankiw, 1987; Poterba and Rotemberg, 1990; and Trehan and Walsh, 1990). However, the inflation rate is affected by various factors other than seigniorage revenue. Furthermore, governments can generate seigniorage revenue even if there is no inflation (see, for example, Klein and Neumann, 1990). Berument (1994) sets up a model where seigniorage revenue is proxied by the monetary base growth. Therefore, this paper tests the implication of the hypothesis where the seigniorage revenue is proxied by monetary base growth as well as inflation rates, both of which must be positively correlated with the logarithm of tax rates. We also incorporate the feedback effect from taxation to income and from monetary base growth from (which influences the opportunity cost of holding) money to real

<sup>1</sup> Governments are also concerned with the loss generated by issuing bonds. The government's intertemporal budget constraint implies that issuing bonds will only postpone the financing problem to a future date, and ultimately governments must bear the loss generated by either taxation or seigniorage revenue.

money holdings by including the logarithm of the money-income ratio.

However, divided governments will have difficulty in raising revenue by taxation, so the creation of seigniorage revenue should be higher at a given level of taxation. Furthermore, creation of seigniorage revenue will be lower if a country has a fixed exchange rate regime system. Hence, the following equations will be estimated to test the basic hypotheses of this paper: there is a positive relationship between tax and seigniorage revenues, seigniorage revenue creation is lower when a country has a fixed exchange rate regime, and the seigniorage revenue increases when a country has a divided government. Equation 1 uses the monetary base as a proxy for seigniorage revenue and Equation 2 uses inflation as a proxy for seigniorage revenue.<sup>2</sup>

$$\ln \frac{M_t}{M_{t-1}} = \gamma_1 + \gamma_2 \text{Fix}_t + \gamma_3 \ln \theta_t + \gamma_4 \ln \frac{m_t}{y_t} + \gamma_5 \wp_t + \epsilon_t \quad (1)$$

$$\ln \frac{P_t}{P_{t-1}} = \gamma'_1 + \gamma'_2 \text{Fix}_t + \gamma'_3 \ln \theta_t + \gamma'_4 \ln \frac{m_{t-1}}{y_t} + \gamma'_5 \wp_t + \epsilon'_t \quad (2)$$

Where  $\ln \frac{M_t}{M_{t-1}}$  is the high-powered money growth rate,  $\ln \frac{P_t}{P_{t-1}}$  is the inflation rate,  $\ln \theta_t$  is the logarithm of the tax-GNP ratio,  $\ln \frac{m_t}{y_t}$  is the logarithm of the real monetary base-real GNP ratio,  $\ln \frac{m_{t-1}}{y_t}$  is the logarithm of the lag value of the real monetary base-real GNP ratio,  $\wp_t$  is the dummy variable for divided governments; the dummy variable has a value of one if the Congress and Presidency are controlled by different parties, and a value of zero otherwise and  $\text{Fix}_t$  is the dummy variable for the fixed exchange rate regime; it has a value of one prior to 1973, and a value of zero otherwise. All the estimated coefficients except  $\gamma_2$  ( $\gamma'_2$ ) are expected to be positive, and  $\gamma_2$  ( $\gamma'_2$ ) to be negative.

The instrumental variable (IV) technique is used to estimate Equations 1 and 2 for a sample of the US annual data from 1951 to 1991.<sup>3</sup> The tax rate is measured as the government's tax revenue-GNP ratio. The tax rate may not be an exogenous variable because the government determines its seigniorage and tax revenues simultaneously. Moreover, various economic factors, such as business cycles and the President's approval rating, could affect both taxes and the money growth rate.<sup>4</sup> Hence, when the ordinary least squares method is used to estimate the model, the estimated coefficients may be biased.

High-powered money is used as money stock which is reported in Friedman and Schwartz (1982) and updated from the *Flow of Funds Accounts* of the Board of Governors of the Federal Reserve System. The Federal Government Receipts and the Federal Government Spending are obtained from the *Economic Report of the President*. The government's approval

ratio is the President's approval rating taken from Gallup surveys; the quarterly means are averaged to obtain the annual figures. The rest of the variables are obtained from the International Monetary Fund's *International Financial Statistics*.

The time trend is included in the regression analysis before estimating the model since both the money growth rate and the tax rate may follow a common trend. Therefore, a simple regression analysis may capture the time trend they share, rather than the underlying relationship between the variables.<sup>5</sup> The optimum financing model suggests not only is there a positive relation between the tax rate and money growth rate (or inflation), but also that the tax rate and money growth rate need to be a random walk. If a proxy of the seigniorage revenue is a dependent variable, the logarithm of the tax rate or the lag value of the dependent variable should be present on the right hand side of Equations 1 and 2, not both of these variables should be present on the right hand side of the equations. Hence, we exclude the lag value of money growth rate from the regression.

The first column of Table 1 reports the estimation results for Equation 1 after considering the first degree autocorrelation; here  $\rho$  is the parameter for the first degree autocorrelation and *DW* represents the Durbin-Watson statistics. First, the estimated coefficient for the tax rate is positive and significant at the 10% level, which supports the hypothesis that the government faces a trade-off between the two financing instruments and raises both of them to finance additional spending. Both the estimated coefficients of the divided government and the exchange rate dummies have negative signs. Even if the implication of the divided government hypothesis is not supported, the estimated coefficient for the fixed exchange rate dummy has an expected sign. However, neither of these coefficients is statistically significant.<sup>6</sup>

The optimum financing literature uses inflation as a measure of seigniorage revenue. In column 2, we used inflation as a measure of seigniorage as well, and the estimated coefficient of the tax rate is positive and significant. Hence, the empirical evidence for the optimum financing model is stronger when the inflation rate is the dependent variable rather than the growth rate of monetary base. However, the divided government dummy is still negative and statistically insignificant, so we still do not find an altered preference for the use of seigniorage revenue for divided governments. On the other hand, the estimated coefficient for the fixed exchange dummy is now negative and statistically significant at the 10% level. This result suggests that, at any given level of tax revenue, when the USA has a fixed exchange rate regime the government relies less on seigniorage revenue than when it has a flexible exchange rate regime.

<sup>2</sup> The derivation of the testable implications of the model is available from the author upon request.

<sup>3</sup> The instruments used are reported in the notes to Table 1.

<sup>4</sup> Berument and Keech (1995) find that governments rely more on seigniorage revenue than taxation as their approval rates decrease.

<sup>5</sup> Both Mankiw (1987) and Poterba and Rotemberg (1990) include a time trend in their regressions.

<sup>6</sup> The level of significance is 5%, unless otherwise mentioned.

Table 1. *Seigniorage-tax relationship for divided governments*<sup>a,b</sup>: 1951–1991

| Variable                  | $\ln \frac{M_t}{M_{t-1}}$ | $\ln \frac{P_t}{P_{t-1}}$ | $\ln \frac{M_t}{M_{t-1}}$ | $\ln \frac{P_t}{P_{t-1}}$ |
|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Constant                  | 41.187                    | 47.838                    | 41.174                    | 33.010                    |
|                           | 1.536                     | 2.164                     | 1.514                     | 1.687                     |
| <i>time</i>               | -0.045                    | -0.199                    | -0.044                    | -0.376                    |
|                           | -0.216                    | -1.002                    | -0.203                    | -2.065                    |
| <i>Fix<sub>t</sub></i>    | -0.852                    | -3.289*                   | -0.861                    | -1.148                    |
|                           | -0.422                    | -1.724                    | -0.405                    | -0.651                    |
| $\ln \theta_t$            | 26.439*                   | 24.541**                  | 26.423*                   | 22.598**                  |
|                           | 1.861                     | 2.370                     | 1.833                     | 2.585                     |
| $\ln \frac{m_t}{Y_t}$     | 4.735                     |                           | -4.696                    |                           |
|                           | -0.665                    |                           | -0.621                    |                           |
| $\ln \frac{m_{t-1}}{Y_t}$ |                           | -6.188                    |                           | -15.832**                 |
|                           |                           | -0.836                    |                           | -2.192                    |
| $\phi_t$                  | -0.847                    | -1.396                    | -0.851                    | -0.269                    |
|                           | -0.761                    | -1.379                    | -0.741                    | -0.283                    |
| <i>Growth</i>             |                           |                           | 0.312                     | -32.476**                 |
|                           |                           |                           | 0.0179                    | -3.188                    |
| $\rho$                    | 0.320*                    | 0.629**                   | 0.320*                    | 0.658**                   |
|                           | 1.954                     | 3.826                     | 1.923                     | 4.527                     |
| $R^2$                     | 0.855                     | 0.902                     | 0.855                     | 0.932                     |
| <i>DW</i>                 | 1.601                     | 1.576                     | 1.600                     | 1.901                     |

Notes:  $\ln \frac{M_t}{M_{t-1}}$  = high-powered money growth rate,  $\ln \frac{P_t}{P_{t-1}}$  = inflation rate, *time* = time trend,  $\ln \theta_t$  = logarithm of the tax rate,  $\ln \frac{m_t}{Y_t}$  = logarithm of the real monetary base-real GNP ratio, and  $\ln \frac{m_{t-1}}{Y_t}$  = logarithm of the lag value of the real monetary base-real GNP ratio.  $\phi_t$  = dummy variable for divided governments; it has a value of one if the Congress and Presidency are controlled by different parties, and a value of zero otherwise. *Fix<sub>t</sub>* = dummy variable for the fixed exchange rate regime; it has a value of one prior to 1973, and a value of zero otherwise. *Growth* = real GNP growth,  $\rho$  = the first degree autocorrelation coefficient, and *DW* = Durbin–Watson statistics.

<sup>a</sup> *t*-ratios are reported under the corresponding estimated coefficients.

<sup>b</sup> Instruments used include a constant, the time trend, a dummy variable for the periods before 1973, the lagged value of the money growth rate, the lagged value of the logarithm of tax-GNP ratio, the lagged value of the inflation rate, the lagged value of GNP growth, the logarithm of the lagged money-income ratio, dummy variables for the term of the administration, the lagged value of the term dummies with the President's approval rating, the lagged values of the export-GNP ratio, the logarithm of the lagged value of the import-GNP ratio, the logarithm of the wage earnings-GNP ratio, and the lagged value of the logarithm of the government spending-GNP ratio.

\* indicates 10% level of significance.

\*\* indicates 5% level of significance.

The optimum financing models do not attempt to account fully for how government determines its monetary and fiscal policies; rather, the model considers seigniorage revenue as one of several motives that the government uses to determine its economic policies.<sup>7</sup> Another important factor that affects a government's fiscal and monetary policies is business cycles. In order to control for the business cycle effect, we follow Mankiw (1987) and include the growth rate of the real GNP in the regression analysis on an *ad hoc* basis. The results are

reported in columns three and four.<sup>8</sup> If we consider the business cycle effects on an *ad hoc* basis, the evidence supporting the exchange rate regime effect is weakened when the seigniorage revenue is proxied by the inflation rate. However, the results of the divided government hypothesis are still robust.

The findings on divided governments for the seigniorage revenue may still be consistent with the explained behaviour of deficit suggested by Roubini and Sachs (1989a, 1989b) and others. Divided governments may have some difficulties decreasing their spending. According to the optimum financing model, higher spending requires increasing both tax and seigniorage revenues. Since seigniorage revenue increases with spending, this requires that taxes increase less than government spending; hence, the deficit should be higher for divided governments. However, this does not require that the seigniorage-tax revenue ratio change.

### III. SUMMARY

The divided government argument suggests that when the Presidency and Congress are controlled by different parties, governments are less able to reduce their budget deficits than when they are controlled by the same party. We test the implication of the divided government argument for the seigniorage-tax revenue trade-off which governments face to finance spending. Using the annual data from 1951 to 1991, we could *not* find any evidence suggesting that the choice between tax and seigniorage revenue to finance spending is any different when the Presidency and at least one branch of Congress are controlled by different parties than when both branches are controlled by the same party. Therefore, the divided government argument which has been used to explain the behaviour of the deficit cannot be used to explain the seigniorage-tax revenue relationship. However, we found partial support for the hypothesis that a fixed exchange rate regime is coupled with less seigniorage revenue. Further research is needed to determine the mechanism by which a divided government and its exchange rate regime affect the government's economic policies.

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<sup>7</sup> For a full discussion of a government's possible motives regarding how its economic policies are determined, see Cukierman (1992).

<sup>8</sup> We also included additional variables to the regression analysis such as government spending-GNP ratio, balance of payment deficit-GNP ratio and the President's approval rate. When we include these variables in the business cycle specifications given in columns three and four, we obtained only statistically insignificant coefficients for additional variables in each case. To save space these results are not reported here.

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