Seigniorage, taxation and myopia in EMU

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## Abstract

We examine policy coordination in a two-country world with two types of asymmetries. The first type of asymmetry is a difference in the efficiency of taxation systems, the second is a varying degree of government myopia as represented by discount rates. We examine the conditions under which cooperation is beneficial for both countries and we examine how asymmetries affect the loss in predicted by discretion. Our results show that if asymmetries are too great, EMU has poor welfare properties.

**JEL Classification:** E6, F16 E61

**Keywords:** EMU, asymmetry, government myopia.
2. Presentation of the model

...
Using the Lagrangian we derive the first-order conditions. Scarcity of countries with a tilde. We minimise under the constraint, where we take account of notation further. We will note the sum of the relevant variables in both the common central bank and up to a level that assures solvency. Formally is identical and the results are symmetrical in this respect. To shorten treasury computes its optimal taxation level and grabs seigniorage from variables in the country because the algebra for the other country without taking into account the action of the fellow government. Each with a check accent. In what follows we will be constantly using the with a circled accent, while the variables of the second will be noted.

\[
\begin{align*}
A - d &= \frac{\partial}{\partial z}
\end{align*}
\]

In this section, we study equilibria that rely on the existence of a rule. The time-inconsistency problem motivates the study of rule and discretion. A solution with a rule 3. A time-consistency issue can arise if the government deviates from a rule. The time-consistency problem motivates the study of rule (R) and discretion (D). The non-cooperative (N) equilibrium is characterized by the fact that there is no cooperation. Without cooperation, each government minimises its loss with respect to the action of the other government. In the non-cooperative equilibrium, each country is interested in surprising the public with inflation in order to decrease the real burden of its debt. Formally, we introduce the dis-
There are several points to watch. As noticed, we notice that both taxation and inflation are linear functions with a constant,

\[ (d+1)d \left[ \frac{g \gamma - c \zeta - (d \gamma + \delta \zeta)}{(g - d \gamma + \delta \zeta)(\gamma - d \gamma + \delta \zeta)(\gamma^2 - \gamma + \delta \gamma)} \right] = 1^n^p \]

These conditions are expressed as:

\[ \frac{d + 1}{u w} d + \frac{d}{w - d - u w} = 1^n^p \]

Debt will be equal to the steady state value of the steady state with the size of the accumulator, as a function of an exogenous initial debt.

Debt can then be expressed as:

\[ d > \left( \frac{g \gamma - c \zeta - (d \gamma + \delta \zeta)}{(g - d \gamma + \delta \zeta)(\gamma - d \gamma + \delta \zeta)(\gamma^2 - \gamma + \delta \gamma)} \right) \]

The condition is satisfied when the interest rate is lower than the steady state will be reached. It is decided to determine the denominator of the model. If the denominator is greater than the accumulator, we can get the accumulator. This relation to the interest on the government income is:

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\[ \left( \frac{d + 1}{u w} d + \frac{d}{w - d - u w} = 1^n^p \right) \]
The curves show the interest rates for which there is no growth in debt. For the countries with slightly higher and lower discount rates, the lowest growth of debt is not achieved for symmetry in discount rates, but for a value of the discount rate that is low if the country is slightly more myopic, and high if the country has the lower discount rate. The term slightly is imprecise but important. If the efficient country is very patient, then the growth rate of debt will be large. If one accepts the conventional wisdom—that myopia and low efficiency tend to coincide—the above finding is good news for a non-cooperative monetary union. As long as the asymmetries in the discount rates remain moderate, a non-cooperative monetary union can achieve a lower growth rate of debt by adjusting the discount rate. The computations were done for all curves for $\lambda = 0.6$ and $\lambda = 0.5$, and we let $\lambda$ take on some intermediate values.

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are no closed forms for the resulting sums, which make it cumbersome to
achieve the county results to discount more rapidly than the square of the

\[
\left( \frac{d+1}{z^2 + 1} \right) < g + 1
\]

conditions is not satisfied.

\[
\left( \frac{d+1}{z^2 + 1} \right) \frac{d}{z - d} + \frac{d}{z - w} = m
\]

(23)

be computed.

\[
\left( \frac{d+1}{z^2 + 1} \right) \frac{d}{z - d} + \frac{d}{z - w} = m^2
\]

and in infinite a symbolic solution can be found for the value $t = g$

\[
\frac{(d+1)d(z/d + g/d)}{(z^2 - d^2 + z)d(wu - d^2 + 1 - pd)} = m^2
\]

\[
\frac{(d+1)d(\frac{z}{d} + g/d)}{(z^2 - d^2 + z)d(wu - d^2 + 1 - pd)} = m^2 = m^2
\]

\[
\frac{(d+1)d(g/d + z/d)}{(z^2 - d^2 + z)d(wu - d^2 + 1 - pd)} = m^2 = m^2\]
\[
\frac{\frac{\partial}{\partial \gamma} \left( \frac{\gamma + \alpha d - \gamma \delta_c - \gamma \delta_t + \gamma \mu + \gamma \rho \gamma'}{\gamma'(\gamma + \alpha d - \gamma \delta_c - \gamma \delta_t + \gamma \mu + \gamma \rho \gamma')} \right)}{\frac{\partial}{\partial \gamma} \left( \frac{\gamma + \alpha d - \gamma \delta_c - \gamma \delta_t + \gamma \mu + \gamma \rho \gamma'}{\gamma'(\gamma + \alpha d - \gamma \delta_c - \gamma \delta_t + \gamma \mu + \gamma \rho \gamma')} \right)} - \frac{\partial}{\partial \gamma} \left( \frac{\gamma + \alpha d - \gamma \delta_c - \gamma \delta_t + \gamma \mu + \gamma \rho \gamma'}{\gamma'(\gamma + \alpha d - \gamma \delta_c - \gamma \delta_t + \gamma \mu + \gamma \rho \gamma')} \right) = \gamma' \gamma''
\]

\[
\frac{\partial}{\partial \gamma} \left( \frac{(\gamma - \delta_c - \gamma d) \gamma'}{\gamma'(\gamma + \alpha d - \gamma \delta_c - \gamma \delta_t + \gamma \mu + \gamma \rho \gamma')} \right) + \frac{\partial}{\partial \gamma} \left( \frac{(\gamma - \delta_c - \gamma d) \gamma'}{\gamma'(\gamma + \alpha d - \gamma \delta_c - \gamma \delta_t + \gamma \mu + \gamma \rho \gamma')} \right) = \gamma' \gamma''
\]

\[
\frac{\partial}{\partial \gamma} \left( \frac{(d + 1)(\gamma + \alpha d - \gamma \delta_c - \gamma \delta_t + \gamma \mu + \gamma \rho \gamma')}{\gamma'(\gamma + \alpha d - \gamma \delta_c - \gamma \delta_t + \gamma \mu + \gamma \rho \gamma')} + \frac{(\gamma - \delta_c - \gamma d) \gamma'}{\gamma'(\gamma + \alpha d - \gamma \delta_c - \gamma \delta_t + \gamma \mu + \gamma \rho \gamma')} \right) = \gamma' \gamma''
\]

In equilibrium the public will take into account the fact that the government is not a perfectly infallible decision maker.

The introduction of discretion is motivated by the presence of nominal parameters in the government's budget constraint. The formulation implicitly assumes that the government can make its promises and then renege on them at a later date, thus changing its behavior over time.

If the government is making a series of promises and then reneging on them, it will be forced to make good on its promises. The government can only make promises that it can fulfill, or it will face the consequences of non-compliance.

The introduction of discretion is treated as part of the government's budget constraint, but the formulation implicitly assumes that the government can make promises that it will fulfill, or it will face the consequences of non-compliance.

The budget constraint in the presence of discretion is expressed as follows:

\[
\frac{\partial}{\partial \gamma} \left( \frac{(\gamma - \delta_c - \gamma d) \gamma'}{\gamma'(\gamma + \alpha d - \gamma \delta_c - \gamma \delta_t + \gamma \mu + \gamma \rho \gamma')} + \frac{(d + 1)(\gamma + \alpha d - \gamma \delta_c - \gamma \delta_t + \gamma \mu + \gamma \rho \gamma')}{\gamma'(\gamma + \alpha d - \gamma \delta_c - \gamma \delta_t + \gamma \mu + \gamma \rho \gamma')} \right) = \gamma' \gamma''
\]
To sum up, we note that there are two steady states in discretion in government spending is important when compared to more stock. In this model, only one will be stable, depending on the values of the parameters. A steady state is stable if
\[
\left(\frac{\mu + \varepsilon g}{\varepsilon / g - \delta + d} \right) \left(1 + \frac{1}{\lambda} \right) \left(\frac{\mu + \varepsilon g}{\varepsilon / g - \delta + d} \right) > \left(\frac{\mu + \varepsilon g}{\varepsilon / g - \delta + d} \right) + \lambda 
\]

and in the reputation case, the amount of transaction cost is equal to
\[
\left(\frac{\mu + \varepsilon g}{\varepsilon / g - \delta + d} \right) \left(1 + \frac{1}{\lambda} \right) \left(\frac{\mu + \varepsilon g}{\varepsilon / g - \delta + d} \right) = \frac{1}{\lambda} = \alpha_i^{(s)}
\]

This is the steady state of the reputation equilibrium. It coincides with
\[
\frac{d}{b - \mu u} = \alpha_i^{(s)}
\]

because the interest rate represents the cost of accumulated real assets rather than keeping a burden debt. However, the higher the interest rate, the more stock is provided by the government, so it is important when compared to the analogous assumption to \(\mu / g + \varepsilon / g\). As in the reputation case, the amount of transaction cost is equal to
\[
\left(\frac{\mu + \varepsilon g}{\varepsilon / g - \delta + d} \right) \left(1 + \frac{1}{\lambda} \right) \left(\frac{\mu + \varepsilon g}{\varepsilon / g - \delta + d} \right) = \frac{1}{\lambda} = \alpha_i^{(s)}
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\]

This is a steady state that does not depend on spending, neither is it
In this section we present graphically the results of simulations of the model. Surface plots allow us to capture the influence of parameters in two countries simultaneously. We focus on the two asymmetries in the model. The first one is the efficiency of the tax system, or in-distribution-aversion, represented by the pair \((C, C)\). The other is the pair of discount factors \((E, E)\). All graphs depict the parameter for one country, the "Home" country, on the \(x\)-axis, and the same parameter for the other country on the \(y\)-axis. We study the influence of asymmetries on two variables. The first is the gain associated with cooperation for the "Home" country. Here we plot the difference of the loss in non-cooperation minus the loss of cooperation. This variable can be expected to be positive most of the time. Note that even in reputation, it is not positive everywhere because we consider the loss of a particular government, rather than the global loss that both countries suffer. The second variable on which we focus is the natural complement of the first. Here we answer the question: what is the loss occurred in discretion when compared with reputation? In our formulation, this variable should be expected to be negative, i.e., discretion induces a welfare loss. However, the situation depends on whether we consider the loss in non-cooperation or the individual loss in cooperation, hence we inspect both cases separately. There are 8 cases in total.

Concentrating on relative gains/losses, calibration can be kept very simple. For all runs, we chose \(g = 0.25\), \(n = 0.25\), \(\alpha = 0\), \(\delta = 0.6\), and \(\theta = 0.06\). For all runs, we chose \(\theta = 0.25\), \(\eta = 0.25\), \(n = 0.25\) and \(\delta = 0.06\). Very simple. For all runs, we choose \(\delta = 0.06\). If after 1000 iterations the criterion was not fulfilled, no finite equilibrium was supposed to exist. This case did not occur. All computations were carried out with a single Maple V script. All numerical values are taken as percentages. For the reputation values, the computation is straightforward. For the efficiency values, the computation is straightforward. All computations were carried out with a single Maple V script. It is available on request from the author.

Figure 3: Gain from Cooperation in Reputation
If the efficiency is asymmetric in a discretion regime, the country that has lower efficiency experiences a loss from non-cooperation. From a collective viewpoint, the amount the country gains from cooperation from a discretion perspective is the same as from a reputation perspective. However, if the efficiency is asymmetric in a discretion regime, the country that has lower efficiency will prefer non-cooperation to cooperation. This is because the curve is much steeper to the left of the line of equal efficiency than it is to the right. If a system of transfers can be implemented, then non-cooperation is Pareto inefficient.

The next figure depicts the same computations as Figure 3, but for discretion. Casual inspection suggests that the functional form of the gain of welfare through cooperation as a function of $\gamma$ and $\theta$ is the same. However, there are two major changes. First, the curve is less steep as a whole. If the efficiency is asymmetric in a discretion regime, the country that has lower efficiency experiences a loss from non-cooperation. From a collective viewpoint, the amount the country gains from cooperation in a discretion regime is the same as from a reputation perspective. However, if the efficiency is asymmetric in a discretion regime, the country that has lower efficiency will prefer non-cooperation to cooperation. This is because the curve is much steeper to the left of the line of equal efficiency than it is to the right. If a system of transfers can be implemented, then non-cooperation is Pareto inefficient.

Figure 2: Loss from Non-cooperation in Discretion

Figure 3: Gain from Cooperation in Discretion

Figure 2: Loss from Non-cooperation in Reputation

Figure 3: Gain from Cooperation in Reputation
We now study if reputation can be sustained by comparing the loss and cooperation ends up yielding higher welfare. When a country faces a less expansionist policy, it would be expected by the public that it would adopt a less expansionist policy. Therefore, the cooperative policy maker which stimulates would have the advantage, because the minimum penalty is lower than the penalty suffered by the non-cooperating country. The penalty is lower because the expansion is more moderate than the penalty suffered by the non-cooperating country. The penalty for a more moderate expansion would be lower. Therefore, the cooperative tax system appears in the vicinity of equal efficiency. A cooperative decision maker facing two different tax systems would choose a more moderate expansion than a non-cooperative decision maker facing two different tax systems. The difference in moderate expansion appears in the vicinity of equal efficiency. A cooperative decision maker facing two different tax systems would choose a more moderate expansion than a non-cooperative decision maker facing two different tax systems. The difference in moderate expansion appears in the vicinity of equal efficiency. A cooperative decision maker facing two different tax systems would choose a more moderate expansion than a non-cooperative decision maker facing two different tax systems. The difference in moderate expansion appears in the vicinity of equal efficiency. A cooperative decision maker facing two different tax systems would choose a more moderate expansion than a non-cooperative decision maker facing two different tax systems. The difference in moderate expansion appears in the vicinity of equal efficiency.
This number is negative when rules are preferred. We call this number the penalty. When passing to numerical simulations we are facing the problem that the loss of an individual country may not be finite; even in the case of non-cooperation the penalty rises more quickly than the loss of the efficient country. This means that the central planner will be biased towards the efficient country, even if the other country is very inefficient. As we have seen, non-cooperation is not Pareto dominant for strong efficiencies. If the efficient country is more efficient, however, the loss of discretion decreases when the other country becomes more expansionist. For this reason non-cooperation is not Pareto dominant for strong inefficiencies. Cooperation does not seem to matter for the broad picture, but we do recognise that there is a small range where the home country prefers discretion to rules. That is the case if the home country prefers discretion to rules.
The situation in discretion is more complex. As we can see from Figure 1, the region where the myopic country would prefer cooperation is overall beneficial to both countries within a monetary union. Cooperation is overall beneficial to both countries when no equilibrium exists, where the myopic country prefers cooperation to discretion.

Over all, the findings are rather pessimistic. Asymmetries have a large impact on the outcome in this type of games. If different in cooperate, the myopic country will prefer cooperation to reputation. Here the Rogoff paradigm applies. This is consistent with earlier findings for discretion. If asymmetries are strong, then the myopic country will find that the lower discount rate of the central planner yields a higher welfare.

Wen now turn our attention to the loss in discretion as a function of the discount rate. In Figure 9 and Figure 10, we see the plot in the case of non-cooperation and cooperation, respectively. Overall we can be assured that reputation is stable in the sense that a government that can choose between reputation and discretion would always choose reputation, if that reputation equilibrium exists. We note however that the myopic country will become almost indifferent between reputation and discretion in the cooperative case. Conclusions

Having two asymmetric countries in a monetary union, we can see from Figure 2 that cooperation is overall beneficial to both countries within a monetary union. Cooperation is overall beneficial to both countries when no equilibrium exists, where the myopic country prefers cooperation to discretion. Here the Rogoff paradigm applies. This is consistent with earlier findings for discretion. If asymmetries are strong, then the myopic country will find that the lower discount rate of the central planner yields a higher welfare.

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References


