3. Contract with two agents in the electoral period

The two agents will be encouraged by the politician's incentives to make an effort to achieve the economic scenario that increases the politician's chances of being re-elected. Making an effort often involves costs. Let C_b be the cost of BA's effort and C_p that of CB. These costs will obviously exist only if $e_b = 1$ and, respectively, $e_p = 1$. Therefore $C_b > 0$ if $e_b = 1$ and $C_b = 0$ if $e_b = 0$. Similarly with C_p. We consider C_b and C_p constant.

The incentive expected by BA will therefore be

(11) $E(I_b \mid e_b) = t_b \Pr(-Bs \mid e_b) + T_b \Pr(Bs \mid e_b) - C_b(e_b)$

And that of CB will be:

(12) $E(I_p \mid e_p) = T_p \Pr(-Ps \mid e_p) + t_p \Pr(Ps \mid e_p) - C_p(e_p)$.

The incentive constraint for BA is that:

(13) $E(I_b \mid e_b = 1) \geq E(I_b \mid e_b = 0)$

In other words this authority expects a higher incentive when it makes an effort to achieve stability in the banking system, compared to when no effort is made.

Clearly the essential condition for the agent to agree with the contract is that if he makes an effort, he will receive a non negative amount. Therefore the participation constraint is:

(14) $E(I_b \mid e_b = 1) \geq 0$.

In other words, for BA to have the incentive to make an effort it is necessary that conditions (13) and (14) are verified.

Similarly, the incentive and participation constraints for CB will be:

(15) $E(I_p \mid e_p = 0) \geq E(Ip \mid e_p = 1)$

(16) $E(I_p \mid e_p = 0) \geq 0$.

As it is an election period, we have seen that the politician gains greater utility if there is price instability. It will therefore be to his advantage to make a contract that induces the central bank not to pursue price stability, but which instead fosters the development of a degree of inflation.

Consequently, he will offer a contract that pushes the agent to pursue an expansionist monetary policy. This means no effort on the part of the agent ($e_p = 0$). For his part, the agent expects higher remuneration if he pursues instability and – the minimum condition for him to agree to the contract – the remuneration must be positive. In other words, (15) and (16) must hold.

To find the values of t_b, T_b, t_p, T_p that maximize E(U-u) under constraints (13)-(16), we need to solve the problem of constrained optimization (see appendix A).

From an analysis of the cases that solve this problem (see appendix A), we obtain that the acceptable solutions are[20]:

i) $t_b = -T_b \qquad T_b = C_b / (2\,P_{1b} - 1) \qquad$ if $\quad P_{3b} \leq 1/2 < P_{1b}$

ii) $t_b = -C_b\,P_{3b} / (P_{1b} - P_{3b}), \qquad T_b = C_b\,(1 - P_{3b}) / (P_{1b} - P_{3b})$ with $P_{3b} \leq 1/2$ and $P_{1b} > P_{3b}$

iii) $t_p = -T_p$ with any positive value for T_p, if $A = 1/2$ with $A = Pr(Ps \mid e_{10})$ (see (A12)).

Keeping in mind that the politician's expected utility function is:

$$E(U\text{-}u \mid e_{10}) = [G - u(T_b) - u(t_p)]\,P_{1b}\,P_{3p} + [G\,(1 + R) - u(T_b) - u(T_p)]\,P_{1b}\,(1 - P_{3p}) +$$
$$+ [g - u(t_b) - u(t_p)]\,(1 - P_{1b})\,P_{0p} + [g\,(1 + r) - u(t_b) - u(T_p)]\,(1 - P_{1b})\,(1 - P_{0p}).$$

we can rewrite this as:

$$(17)\; E(U\text{-}u \mid e_{10}) = H - u(T_b)\,P_{1b} - u(t_b)\,(1 - P_{1b}) - u(T_p)\,(1 - A) - u(t_p)\,A =$$
$$= H - [T_b^2\;P_{1b} - t_b^2\,(1 - P_{1b}) + T_p^2\,(1 - A) - t_p^2\,A\,]\,/\,2$$

where,

$$(18)\; H = G\,P_{1b}\,P_{3p} + G\,(1 + R)\,P_{1b}\,(1 - P_{3p}) + g\,(1 - P_{1b}\,)\,P_{0p} + g\,(1 + r)\,(1 - P_{1b})\,(1 - P_{0p}) =$$
$$= G\,P_{1b}\,[1 + R\,(1 - P_{3p})] + g\,(1 - P_{1b})\,[1 + r\,(1 - P_{0p})]$$

If we substitute the value of incentive payment identified [i); iii)], in (17), we obtain:

(19) $\mathbf{E(U\text{-}u \mid e_{10}) \;= H - [C_b^2 / (2\,(2\,P_{1b} - 1))]}$

If we substitute incentive payments [ii); iii)], we obtain:

(20) $\mathbf{E(U\text{-}u \mid e_{10}) \;= H - \;H_0}$

where, $H_0 = C_b^2\,[(1 - P_{3b})^2\,P_{1b} - P_{3b}^2\,(1 - P_{1b})]\,/\,(2\,(P_{1b} - P_{3b})^2)$.

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[20] Solutions i) and iii), derive from cases I) and V), in appendix A, which say that when the two agents agree to the politician's requests, they expect a benefit at least large enough to cover the costs incurred in achieving the goal. If, on the other hand, they act in a way considered "not correct" by the politician, they will be punished by him, for the bad result achieved. In this case they obtain a negative expected benefit (see appendix A). Solution ii) which, it might be objected, may seem less rational from an economic point of view, leads however to the same type of results.

We can prove (see (E1) in appendix) that

$-1 / (2 P_{1b} - 1) \leq -[(1 - P_{3b})^2 P_{1b} - P_{3b}^2 (1 - P_{1b})] / (P_{1b} - P_{3b})^2$

and that $[(1 - P_{3b})^2 P_{1b} - P_{3b}^2 (1 - P_{1b})]$ can only be positive (see (E2) in appendix).

So (19) ≤ (20).

Therefore the maximum value of E(U-u), with two agents in electoral period, is (20).

4. Contract with two agents in the non-electoral period.

As we have already said, in the non-electoral period the politician will prefer stability in the banking system and price stability. Therefore, in this period the politician's utility expected net value will be:

$$(21)\ E(U\text{-}u) = [G (1 + R) - u(T_b) - u(T_p)] P_{2b} P_{1p} + [G - u(T_b) - u(t_p)] P_{2b} (1 - P_{1p}) +$$
$$+ [g (1 + r) - u(t_b) - u(T_p)] (1 - P_{2b}) P_{2p} + [g - u(t_b) - u(t_p)] (1 - P_{2b}) (1 - P_{2p}) =$$
$$= H' - u(T_b) P_{2b} - u(t_b) (1 - P_{2b}) - u(T_p) B - u(t_p) (1 - B)$$

where

$$(22)\ H' = G P_{2b} (1 + R P_{1p}) + g (1 - P_{2b}) (1 + r P_{2p})$$

BA's incentive and participation constraint is that they are

$$(23)\ E(I_b \mid e_b = 1) \geq E(I_b \mid e_b = 0)$$

$$(24)\ E(I_b \mid e_b = 1) \geq 0.$$

Likewise the incentive and participation constraints for CB will be

$$(25)\ E(I_p \mid e_p = 1) \geq E(I_p \mid e_p = 0)$$

$$(26)\ E(I_p \mid e_p = 1) \geq 0.$$ [21]

As in the previous section, the various cases that can eventuate need to be analysed. This analysis reveals that the possible solutions to the problem of optimization are the following[22]:

[21] See appendix B.) for the solution to the problem of constrained optimization.

[22] Other solutions, which result by the first-order conditions, are the following :

iii) $t_b = T_b = 0$ if $P_{0b} = P_{2b}$

iv) $t_b = -C_b P_{0b} / (P_{2b} - P_{0b})$, $T_b = C_b (1 - P_{0b}) / (P_{2b} - P_{0b})$ if $P_{0b} \leq 1/2$

v) $t_p = -A C_p / (B - A)$, $T_p = (1 - A) C_p / (B - A)$ if $A \leq 1/2$