Analysis of Optimal Level of IMF Surcharge: Welfare Maximization Problem

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INTRODUCTION

After the covid pandemic crisis, countries have been experiencing global economic hardship. However, the impact of economic crisis does not come equally between emerging and developed countries. The impact is much worse if a country was already in economic downfall, or if they do not have wide range of options to secure their economy. IMF has been an option to temporarily mitigate the economic crisis for countries. However, the lending from IMF comes with price. In academia, there have been debate about IMF's lending system especially about the cost of the debt. One big cost for borrowers is IMF surcharge.

This paper analyzes the optimal level of IMF surcharge based on Microeconomic theory. We utilize a country's welfare function and its budget constraint. We derive the optimal IMF surcharge model by solving a hypothetical country's welfare maximization problem.

IMF surcharge is an extra fee charged to countries when they borrow the amount of money exceeding the IMF quota threshold. However, whether IMF should charge for the extra fee has been contentious debate after consecutive economic crisis. From countries' perspective, the surcharge payment is a significant cost which preventing them from allocating their budget efficiently for public goods and development. Efficient budget allocating is even more vital for developing countries because they have limited access to resources. Charging optimal level of surcharge will mitigate this inefficient problem. Therefore, it is important to analyze the optimal level of surcharge for both countries and IMF.

The paper proceeds as follows. Part I introduces the mathematical model for this research. Part II shows the calculation of the welfare maximization problem. Part III shows the application of this equation to the real data of countries. The final section concludes.

PART I. MODEL

We employ micro based maximization approach. Two main functions for our analysis are as follow,

$$\mathcal{W} = x^{\alpha} y^{\beta} \cdots (1), where\ \alpha + \beta = 1$$

$$\Pi = x + y \cdots (2)$$

$\mathcal{W}$ is defined as a welfare function for a country. It represents the level of welfare for a country.

y represents the amount of debt expenditure for a country. This includes any type of debt payments. For our research, it can be further expressed as

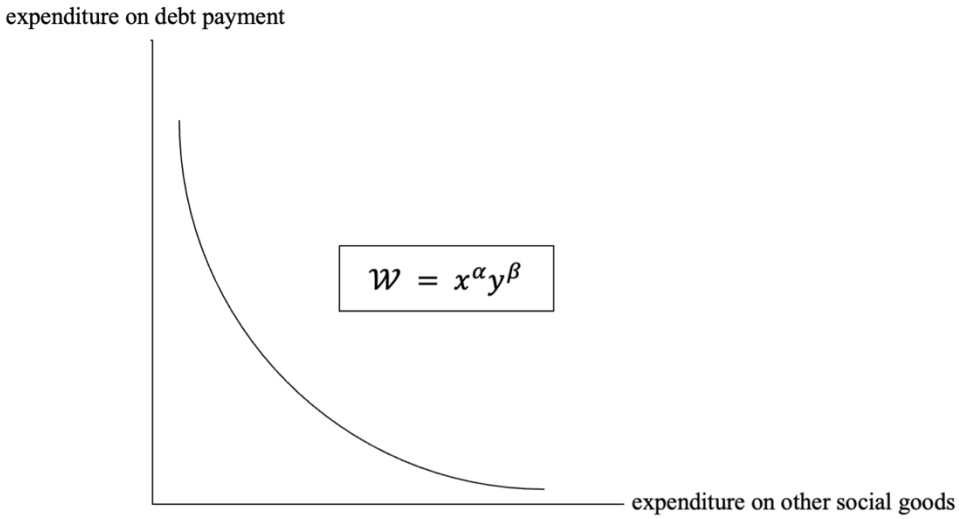
$$y = \ell + \mathcal{E} \cdots (3)$$

Where ℓ represents the debt expenditure from IMF, and $\mathcal{E}$ represents all other kinds of debt expenditure. Then, we can further break down ℓ.

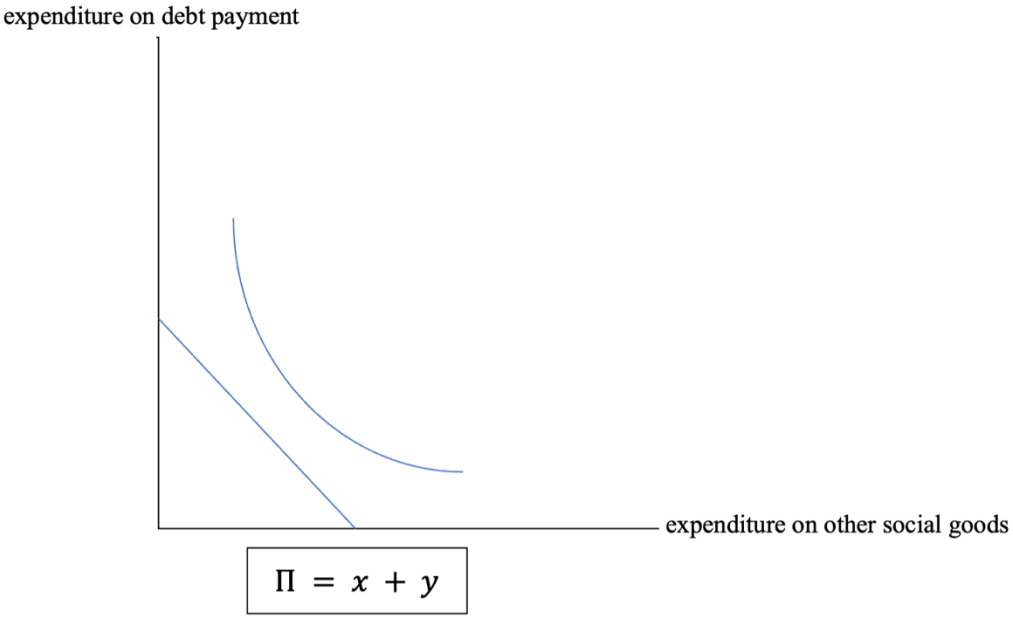
$$\ell = I(0.01 + SDR) + S(I - \theta * 1.875) \cdots (4)$$

I is the total amount of debt borrowed from IMF, and (0.01 + SDR) is the interest rate to borrow money from IMF. S is our interest variable, and it represents the surcharge rate. θ in equation (4) is the quota for each country.

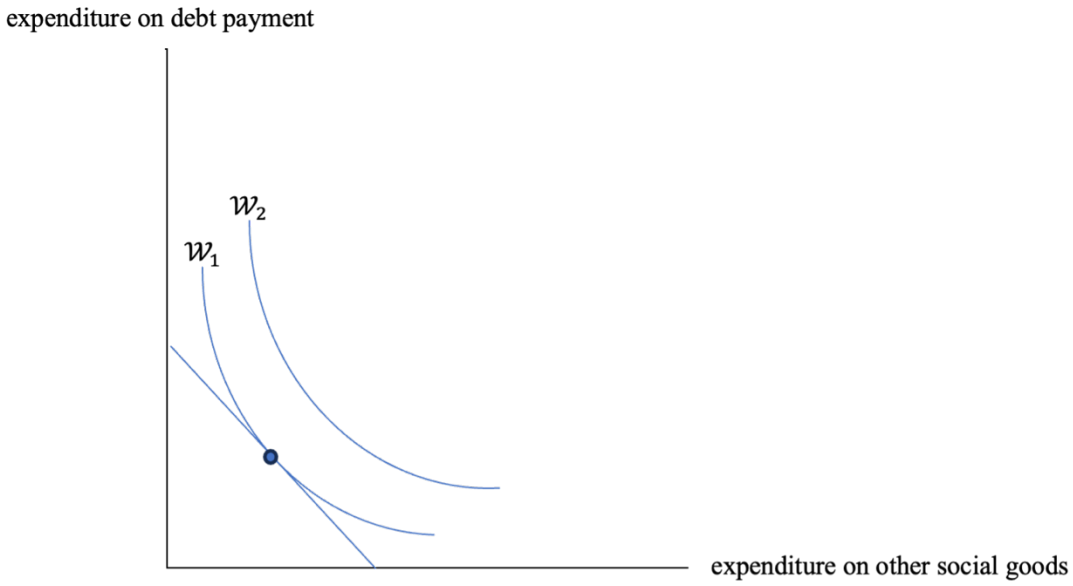
Finally, our x represents any other government expenditure in different sectors. $\alpha\ and\ \beta$ are the proportional relationship between debt expenditure and other expenditure. We utilize Cobb-Douglas function, and we assume x and y have substitution relationship with decreasing marginal welfare. When we draw the equation (1), it will look as follow,



The second equation (2) is the budget constraint for the government. We assume governments try to allocate their budget rationally between debt and social goods; thus, they spend all their budget. If we plot the budget constraint, it will look as follow with arbitrary welfare function.



Our object of this paper is to find the optimal value of S, surcharge rate, for a country with given constraint. Thus, our goal is to find the point A in the figure below.



At point A, the country will maximize their welfare, and they are allocating their budget on debt payment and social goods in efficient way.

PART II. CALCULATION

Rewrite,

Country's Welfare Function: $\mathcal{W} = x^{\alpha}y^{\beta}$

Country's Budget Constraint: $\Pi = x + y$

By F.O.C, we can derive following LaGrange multiplication equations:

$\mathcal{L} = x^{\alpha}y^{\beta} + \lambda(\Pi - x - y)$

$\frac{\partial \mathcal{L}}{\partial x} = \alpha x^{\alpha-1}y^{\beta} - \lambda$

$\frac{\partial \mathcal{L}}{\partial y} = \beta x^{\alpha}y^{\beta-1} - \lambda$

$\frac{\partial \mathcal{L}}{\partial \lambda} = \Pi - x - y$

Then, $\alpha x^{\alpha-1}y^{\beta} = \beta x^{\alpha}y^{\beta-1} \leftrightarrow \frac{y}{x} = \frac{\beta}{\alpha}$

Substitute $y \rightarrow I(0.01) + SDR * I + S(I - \theta * 1.875) + \mathcal{E}$

Rewrite as: $\frac{I(0.01)+SDR*I+S(I-\theta*1.875)+\mathcal{E}}{x} = \frac{\beta}{\alpha}$

or $I(0.01) + SDR * I + S(I - \theta * 1.875) + \mathcal{E} = \frac{x\beta}{\alpha}$

$$\therefore S^* = \frac{x\beta - I(0.01) - SRD * I - \mathcal{E}}{(I - \theta * 1.875)\alpha} = \frac{x\beta - I(0.01 + SRD) - \mathcal{E}}{(I - \theta * 1.875)\alpha}$$

PART III. APPLICATION TO REAL DATA

We collected real life data for each variable, $x\beta, I, SRD, \mathcal{E}, \theta$ and α. By doing this, we check whether countries are currently paying the optimal level of surcharge. Three countries, Argentina, Egypt and Ecuador, have borrowed the most money from IMF. Thus, we apply their data to our model. Table 1 shows the value of each variable.

Table 1. Value of each variable

Country	Quota, θ in SDR millions	SDR	Total government expenditure on public, x, in SDR millions	Amount of Loan from IMF, I, in SDR millions	Proportion of debt expenditure, β	Proportion of social expenditure, α	Debt expenditure other than IMF, $\mathcal{E} = y - \ell$
Argentina	3187.3	0.04	17877.23	31587.50	0.1	0.9	5349.55
Egypt	2037.1	0.04	17685.87	10289.64	0.37	0.63	16386.27
Ecuador	697.7	0.04	17496.43	6490.95	0.3	0.7	5715.23

By substituting the values of variables into the equation, we calculate the optimal level of surcharge, S*, for each country. We collected this data from IMF and each country's government expenditure budget report.

3.1 Argentina

$$S^* = \frac{17877.23(0.1) - 31587.5(0.01 + 0.04) - 5349.55}{(31587.5 - (3187.3 * 1.875))0.9} = -0.223$$

3.2 Egypt

$$S^* = \frac{(17685.87(.37) - 10654.83(0.01 + 0.04) - 16386.27)}{(10654.83 - (2037.1))0.63} = \text{-2.4}$$

3.3 Ecuador

$$S^* = \frac{((17496.43(.3) - 6490.95(0.05) - 5715.23))}{(6490.95 - (697.7))0.7} = \text{-0.2}$$

The calculation shows negative optimal level of surcharge. However, since the surcharge is in the percentage unit, it must be 0 < S* <1. Therefore, we conclude that to maximize the welfare function for these three countries, they should not be charged for IMF surcharge.

PART IV. CONCLUSION

This paper analyzes the optimal level of IMF surcharge countries. We found a general equation for optimal level of surcharge rate based on countries' welfare maximization problem. After we generated the equation for the optimal level of surcharge, we applied countries' real data to find whether they are paying the optimal level of surcharge. Our calculation shows that the three countries for our analysis, Argentina, Egypt and Ecuador, optimize their welfare when they do not pay IMF surcharge. Therefore, it suggests that they should not pay any surcharge at this point to achieve social efficiency. However, they are currently paying about 2-3% of surcharge rate in real life. This result corresponds with the idea of other economists who claim the reformation of IMF (Stiglitz & Gallagher (2022)[1]). These three countries have borrowed tremendous amount of money from IMF due to consecutive economic crisis. It has led their government to re-allocate the budget. In consequence, some countries must reduce their budget on public goods to maintain. Investigating the optimal level of surcharge fee is essential for both countries and IMF. For countries, by analyzing the optimal level of surcharge, they can estimate the ideal allocation between debt payment and social expenditure. However, since countries do not have many options

[1] *Joseph E. Stiglitz & Kevin P. Gallagher, 2022. "**Understanding the consequences of IMF surcharges: the need for reform**," Review of Keynesian Economics, Edward Elgar Publishing, vol. 10(3), pages 348-354, July.*

when they confront economic crisis, it is more important for IMF to analyze the affordable level of surcharge for each country. In this way, IMF could prevent countries' default on their debt; also, the countries would achieve better social welfare. This research can be further extended by investigating the optimal point of surcharge from IMF point of view.