Sri Lanka’s Economic Crisis

Final project report

FEMBA 290 Applied Game Theory for Managers

Team 3 - Harshita Pal, Pratheek Praveen Kumar, Sairam Karuturi

Introduction

Sri Lanka is undergoing its worst economic crisis since its independence in 1948. There is a shortage of food, fuel, and medicines. Critical surgeries have been canceled and at least 500,000 people have fallen into poverty in the last few months [5]. There are daily blackouts and wide-scale protests on the streets of Sri Lanka. Some of the reasons for the current state of the country are explained below.

Lankan Policy: The fundamental problem with Sri Lanka is that it imports more than it exports, and it spends more than it earns. There is a trade and budget deficit. Instead of narrowing down the deficit, the country expanded its debt by borrowing heavily from countries and agencies. The current debt to GDP ratio has risen to 111% [5]. In 2019, the Asian Development Bank flagged this issue but Sri Lanka did not pay any heed.

Politics: In 2019, Gotabaya Rajapaksa was campaigning for presidential elections. One of his election promises was to cut taxes heavily. On Nov 18, 2019, he was elected to office with more than 52% of the votes which led to a series of drastic tax cuts [5]. Rating agencies raised the alarm as they realized that Sri Lanka's state coffers would soon be bleeding, and the country would run out of money. Sri Lanka was downgraded to near default levels. As a result, investors fled the country, and it became difficult for Sri Lanka to access the international markets. In April 2021, Gotabaya banned chemical fertilizers in order to save foreign reserves. Due to this white rice (a staple in Sri Lanka) production fell by 50% and Sri Lanka was forced to import rice (something that had not happened in years) [5]. Furthermore, in July 2021 Sri Lanka banned the import of luxury goods. Basically, the country was scrambling to save dollars.

Infrastructure Bad Debt from China: Sri Lanka switched from a pro-market approach to a welfare-driven mode and started investing in infrastructure. Rajapaksa approached China and took a loan to fund its infrastructure and expand the military. This proved to be a bad debt for China.

Pandemic: Sri Lanka depends on tourism for 13% of its GDP. It is also a source of foreign currency for the country. Due to the pandemic, Sri Lanka could only welcome 0.17 million tourists in 2020 compared to 2.3 million in 2018. By 2021, Sri Lanka's tourism revenue was down to $2.8 billion from $7.5 billion in 2019 [5]. The virus also hit remittances as Lankans in foreign countries stopped sending money.

Amidst all this, the foreign agencies were not lending money to Sri Lanka and so the country turned to its neighbors. Bangladesh loaned Sri Lanka $200 million in 2021, and India lent $500 million in February 2022 [5]. But Sri Lanka could not sustain it. On March 8, 2022, Gotabaya Rajapaksa devalued the Sri Lankan rupee to encourage remittances and to qualify for a loan from the IMF, the International Monetary Fund. Today, $1 is 360 Sri Lankan Rupees. The currency has fallen by 32% since the beginning of this year, prices have soared, and inflation is up by 30.2% [5].

Everything that could go wrong with a country's economy has gone wrong with Sri Lanka. It currently has less than $1.94 billion of foreign exchange reserves in total. It was supposed to pay a $78.2 million interest payment due on April 18 which it defaulted on and has $8.6 billion in debt payments due in 2022. Around $20 billion is needed for essential imports such as food and fuel [5]. Sri Lanka is hoping that the IMF will bail it out, but the money comes with various conditions.

The Game Theory

The actions to be taken by the Sri Lankan government to get the country out of the current economic crisis can be evaluated by conducting games between key players using game theory concepts. The Sri Lankan government has more than $50 billion in external debt and these debts have become so unmanageable that the country is most likely to default on its annual debt payment obligations [1]. Additionally, the country's foreign reserves have depleted to an extent that it cannot afford to import the basic utilities [2]. Looking at the situation holistically, the government would be needing assistance from external parties outside the country. Either it could look at international bodies like the IMF, and the World Bank for economic bailouts, or it could approach further external financial debt from countries that are ready to lend.

We will conduct a game theory analysis for the above-mentioned *3 players* (Srilankan government, International bodies like IMF, and other lending countries) and see what are the possible actions each player could take. Although there are 3 players, there will be 2 different games played here (depicted below) and the reason is stated under the assumptions section.

Game 1: Between the Srilankan government and International bodies like IMF

- *2 possible actions for the IMF* in this game are to grant the bailout to the Srilankan government (with conditions) or to refuse to grant the bailout.
- *2 possible actions for the Srilankan government* in this game are to request/accept the grant from IMF or to not request/decline the grant from IMF.

- This would be *more of a game than simply a decision-making process* as the decisions (which are interdependent) taken by the parties will affect the Srilankan economy in the short run and the credibility of the Srilanka as a responsible borrower and IMF as a responsible lender in the long run.
- Although the Srilankan economy has been in a declining state for quite some time, we are considering Q2 2022 for the scope of this game. The above-mentioned actions by the players would be taken only once in the mentioned time frame so it would be a *one-shot game*.
- In this game, the Srilankan government will always be a first mover as they would be conveying their interest in requesting a grant from the IMF. This translates to being a *sequential game* rather than a simultaneous one, in which each player chooses their action without knowledge of the actions chosen by the other player.
- By looking at the roles and responsibilities of both the players, we can say that both the players have a *common interest* in bringing the Srilankan economy out of the crisis.

Game 2: Game between Srilankan government and Other lending countries

- *2 possible actions of the Srilankan government* in this game are to request/accept the extra line of credit from lending countries and to not request/decline the credit from lending countries
- *2 possible actions of the Lending countries* in this game are to grant/be willing to grant the credit to the Srilankan government or to refuse/not be willing to grant the extra line of credit to the Srilankan government.
- This would also be *more of a game than simply a decision-making process* because the decisions taken by the parties will affect the Srilankan economy and the strategic relationship between the borrowing and lending countries, leading to the interdependency in the actions.
- Since the above-mentioned actions by the players would be taken only once in the time frame (Q2 2022), it would be a *one-shot game*.
- We call a game a simultaneous game when each player chooses their action without the knowledge of the actions chosen by the other player. However, here the Srilankan government would be a first mover by conveying their interest in requesting credit from the lending countries because the benefit of the transaction would be more for the Government, the borrower than the lending country, the lender. This translates to it being a *Sequential game* rather than a simultaneous one.

- By looking at the roles and responsibilities of both the players, we can say that both players have a *common interest* in bringing the Srilankan economy out of the crisis. However, the lending country might have other interests as well, like levying high interest rates and hostile takeover if the borrower defaults on payments. But it's safe to say that both the players have interests in common.

Before we discuss the payoff structure for each of the players in both games, we would like to state the assumption we have taken during the course of the game design.

Assumptions

- As the IMF is an international organization that promotes global economic growth and reduces poverty, its primary interest lies in helping countries that need its assistance. However, in the case of lending countries that provide financial assistance to the borrowing countries, the motives for lending money may not always be in the best interest of the borrower, unlike the IMF. Taking into account this risk, the variation in payoff and the magnitude of payoff for both the players would differ in the two games discussed above.
- For any country which is in need of assistance, international organizations such as the IMF are generally the last resort.
- If an international body like the IMF denies the assistance to the borrowing country, that would affect the credibility of the borrowing country, thereby leading to a huge fluctuation in the payoff structure of the borrowing country rather than the IMF.
- IMF positive payoffs would be in terms of the GDP of the borrowing country and the negative payoffs would be the *opportunity cost of not lending (not being able to achieve the goal of helping a member country)*. Due to the complexity of calculating the opportunity costs. We assume certain percentages based on our understanding.
- Sri Lanka's GDP is approximately $80 billion and the total external debt of the country is around $50 billion [3]. When a country lends credit to the borrowing country, we assume the interest rate to be approximately 2% for a tenure of 10 years.
- The actions taken by IMF and Lending countries in their respective games are not influenced or dependent on each other in any way.

Payoff structure of Game 1

- Under the special drawing rights, Srilanka can get $150 million in aid through IMF [4]. So when Srilanka requests the aid and IMF grants it, $150 million would be its payoff. This aid, in the long term, can benefit the Srilankan economy by 0.1% of its GDP, and that would be the payoff (80 million) for the IMF in helping Srilanka.

- If Srilanka requests the aid from IMF but IMF denies it, then Sri Lanka would head towards a complete economic crash, unless it receives support from elsewhere. For this reason, we can assume the payoff to be a midpoint of complete economic collapse (-40 billion/2 = -20B). The IMF's negative effect of being unable to help its member country will lead to an opportunity cost (unable to fulfill the goal to support). This cost could be assumed to be a percentage of the aid requested. We assume it to be approximately 10% of 150M = 15M for this game.
- If Srilanka doesn't request the aid, but IMF is willing to grant help, the negative payoff for Sri Lanka would be the aid amount it foregoes (150 Million) and the IMF's negative effect of not being able to help the country in spite of its intentions would be a minimal percentage of Sri Lankan GDP. We assume it to be around 0.05% GDP of the Srilankan economy (40 Million)
- Given the current economic crisis Sri Lanka is in, it should be open to exploring all the possible options to pull itself out of the current economic crisis. Not considering exploring any one of the possible sources of financial assistance would have a far more negative impact on Sri Lanka, especially if it requests assistance from the IMF but IMF refuses. This cost will be the cost of complete economic collapse (50 billion, the external debt amount) [3]. IMF would have a 0 payoff in this case as it has nothing to lose.
- Since the magnitude of impact on each player corresponding to each action is different (as discussed in the assumption), payoffs are *asymmetric*.

Payoff structure of Game 2

- The current *annual* payment debt obligation for Srilanka is $7 billion. So this would be the amount Sri Lanka would likely seek from the lending country. While calculating the payoff for Sri Lanka if the credit is granted, we need to account for the interest payments and the risk of stringent conditions put by the lending countries. In the long term, the payoff for the Srilankan government can be $7 billion minus $2 (interest and risks) = $5 billion and for the lending country, it would be the principal amount plus the interest it would gain over the 10-year loan period (8.4 billion).
- If the lending country refuses Sri Lanka's request for an extra line of credit, there would be a negative payoff for Sri Lanka in terms of opportunity cost as Sri Lanka would have missed the time to approach another source for its credit requirement. Accounting for the probability of not getting the credit from other sources as well, the opportunity cost/negative payoff for Srilanka

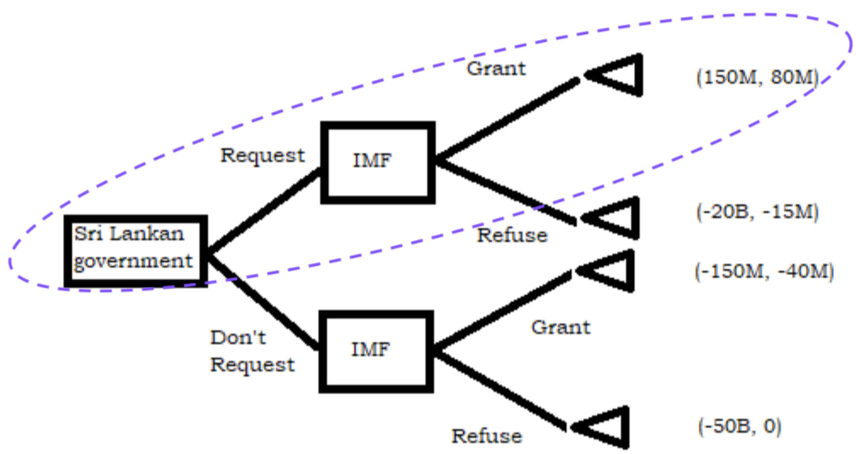
could be $6 billion, $1 billion less than its annual debt obligation. The lending country has nothing to lose if it doesn't grant the credit so its payoff would be 0.

- If the Srilankan government does not request for credit from another country, but a country is open to granting the credit, then the payoff for Sri Lanka would be negative. This is the opportunity cost similar to the previous point (- 6 billion). The negative payoff for the lending country in this case would be the interest it forgoes in the long term if Srilanka had requested the grant (-1.4 billion).
- If neither of the parties convey their interest in requesting or lending credit, the payoffs for both would be zero.

Game Table and Game Tree

Game 1: Bailout from International bodies:

		IMF	
Sri Lanka Govt		Grant with conditions	Don't grant
	Request/Accept	150M, 80M	-20B, -15M
	Don't Request/Decline	-150M, -40M	-50B, 0



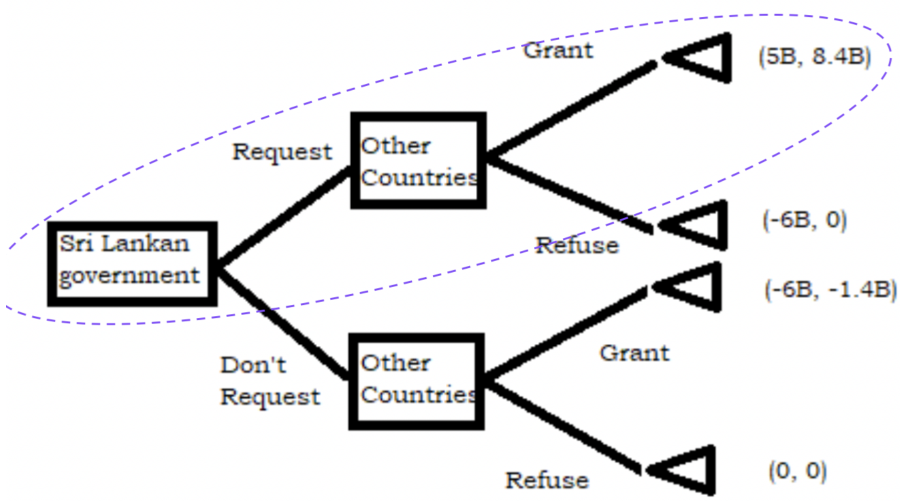
Findings

In the first game, there is a dominant strategy and a dominated strategy. For the Sri Lankan government, the dominant strategy is to request a bailout from the IMF and the dominated strategy is to not request a bailout. Therefore, Sri Lanka will always choose to request the IMF for a bailout. The IMF, on the other hand, doesn't have a dominant or the dominated strategy. Additionally, this is a variable sum game as the sum of all the player's payoffs differs depending on the strategies they utilize.

Using backward induction to determine the probable course of events, we see that if the Sri Lankan government requests a bailout, then the best course of action for the IMF is to grant the bailout (although with conditions). Knowing that this is what is going to happen, the Sri Lankan government will certainly request a loan/bailout as this will result in the best outcome for both the parties. In game 1, the Nash equilibrium occurs when Sri Lanka requests for a loan/bailout and IMF grants the bailout.

Game 2: Finance debt from countries:

		Other lending countries	
Sri Lanka Govt		Grant with conditions	Don't grant
	Request/Accept	5B, 8.4B	-6B, 0
	Don't Request/Decline	-6B, -1.4B	0,0



Findings

For the second game played between the other countries and the Sri Lankan government, there is no dominant strategy or dominated strategy. We can use backward induction in order to determine what is the most probable course of events. If the Sri Lankan government requests for a loan/bailout, then the other countries will most likely grant the bailout. Because the Nash equilibrium occurs when Sri Lanka requests an extra line of credit and the lending countries grant the same. This is also a variable sum game as the sum of all player's payoffs differs depending on the strategies they utilize.

In this game, there is a *possibility of simultaneous game play* leading to two Nash equilibria i.e. Sri Lanka requests and lending countries grants, and Sri Lanka does not request and lending countries does not grant. The same game in a sequential game play leads to only 1 Nash equilibrium i.e. Sri Lanka requests and lending countries grants. Here, game 2 of ours is similar to the *Deer hunt classic game*.

Furthermore, both the games would *not need a mixed strategy* because there is no point in hiding the strategies of any of the parties. Due to the presence of the dominant strategy for Sri Lanka, the probability to request a bailout will always be equal to one.

Conclusion

By conducting the sequential strategy across both the games, we could see that it would be in the best interests of both the lending parties i.e. IMF and lending countries to grant the bailout/extra line of credit to Sri Lanka if it requests for the assistance. This would affect Sri Lanka and its economy positively in the short and long run in terms of economic health and the country's credit profile. This would also affect the lending parties in the long run in terms of strategic relationships.

The outcome of the above games is sensitive to the changes in assumptions we made while designing the games. If we were to not restrict the time frame of the game (Q2 2022), the game would have been more *repetitive* in nature instead of being a one-shot game. When Sri Lanka requests the grant/bailout from IMF, a new possibility in the game could open whereupon denial from the IMF (due to unmet conditions), Sri Lanka could request again by negotiating the conditions of the grant. This, basically, arises when the IMF puts in conditions that Sri Lanka cannot adhere to (such as changes in Sri Lanka's economic policies or political/governmental restructuring). If at all Sri Lanka agrees to abide by IMF obligations, generally it would take a considerable amount of time to accommodate the changes leading to a possibility of a *repetition game (although the strategy remains the same)*. After Sri Lanka agrees or makes the necessary changes, it could again approach the IMF for the grant. Here, the IMF could again either grant or deny the request depending on the socio-economic situation and so the game continues. The same repetitive structure is not possible with game 2 because lending countries' conditions to grant the extra line of credit could be harsh on Sri Lanka, compared to IMF obligations. So it's unlikely that Sri Lanka would work towards meeting the lending countries upon denial, thereby not leading to a repetitive game.

Memo

TO: Sri Lankan government

FROM: Merage Consultants

DATE: 22/5/2022

SUBJECT: Bailout Strategy for Sri Lanka

We acknowledge the efforts that the Sri Lankan government is putting to secure a bailout package from the IMF and other countries and we greatly appreciate it. Based on our analysis of the game between the Srilankan government and the IMF and other countries, we recommend the following course of action to solve the economic crisis plaguing your nation.

We have concluded that, in the long run, it is better to pursue a loan from the IMF and, in the process, abide by the conditions put forth by the IMF for continued support. The Sri Lankan government has to move first and request a loan/bailout package. Not doing so may result in disastrous consequences.

Our calculations indicate that if Sri Lanka does not request the IMF for a bailout, then it would lose a major opportunity which we believe would come up to about $150 million in the short-run (considering the IMF is willing to grant the bailout). If the IMF does not grant the bailout, then Sri Lanka will likely face a total economic collapse which we calculate to be around $40 billion dollars. However, we see a Nash equilibrium when Sri Lanka requests the loan from IMF and IMF accepts with conditions. Therefore, Sri Lanka should strive hard to strike a deal with the IMF which could include accepting a few harsh conditions that the IMF may attach. This would be difficult in the short term but would lead to better results in the future.

In the short term, these reforms might also not be welcomed by the citizens of Sri Lanka. Sri Lanka can also negotiate with the IMF on some of them and not blindly implement the changes, leading to a repetitive game. Some of the conditions that most likely would be put forth by the IMF are as follows.

1. Remove price controls: Prices will go up especially in the agricultural and energy market to reduce shortages and encourage production.

A better course of action would be to ration the basic essentials in the agricultural industry. Buses, tuk-tuks (Sri Lanka's auto), tractors, etc can be given a subsidy and private vehicles (well off commodities) can be taxed higher.

2. Depreciating the currency. Right now 1$ = 360 Sri Lankan rupee. This is likely to get even worse as the IMF will depreciate the ratio even further.
   The alternative can be - the only thing that can move the currency is the demand for exports, and export industries have to be planned, protected, and supported by the government to grow. This can take years, but there's no other way out.
3. Trade liberalization: Eliminating import controls, simplifying the tariff structure, and reducing tariff rates to encourage trade and exports.
4. Public expenditure: Reducing expenditure, reducing civil service headcount plus politicization and expenditure management systems to reduce government borrowing

On the other hand, when considering a loan from other countries rather than the international bodies, Sri Lanka should be extra cautious of policies, interest rates, and external factors. It should take all the factors into account to understand the payoff not only for itself but also for the other country before making any decisions. The good news is that if the Sri Lankan government requests a loan, the lenders will grant the loan because of the favorable potential payoffs for the lenders. Our calculations indicate that both the parties involved will benefit to a huge extent.

Furthermore, it is important for Sri Lanka to maintain a good strategic relationship with neighboring countries such as India which is currently a council member of the United Nations Economic and Social Council. This would help Sri Lanka in having an ally who could vouch for the country and support its socio-economic policies on a global platform.

Thanks,
Best Regards,
Merage Consultants

References

1. DW | Sri Lanka's foreign debt default - https://www.dw.com/en/sri-lankas-foreign-debt-default-why-the-island-nation-went-under/a-61475596
2. Al jazeera | What's happening in Sri Lanka? | Start Here - https://www.youtube.com/watch?v=mLleZNNOa9s
3. The world bank data - https://data.worldbank.org/indicator/DT.DOD.DECT.CD?locations=LK
4. Srilanka receives SDR from IMF - https://www.cbsl.gov.lk/en/news/sri-lanka-receives-sdr-and-initial-disbursement-of-currency-swap-agreement-with-bangladesh
5. WION | Gravitas Plus | Explained: Sri Lankan economic crisis - https://www.youtube.com/watch?v=yJSsq2fW5ZE