Korea GDP Simulation

Math Model & Decision Analysis Assignment 3

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Introduction

Previous South Korean Government announced a pledge, in which the project average Korea GDP (Gross Domestic Product) is designed to be doubled in 10 years. Now 10 years elapsed, the average GDP did not show significant changes yet and project had failed. The chance of having successful project attracted us and we would like to simulate Korea GDP model with uncertainty simulation based on the GDP growth from 2008 to 2018. Beside the result, we will be analyzing the uncertainty belonged to the project and simulating the reality of having doubled GDP in 10 years whether it was possible or not. Theoretically, annual GDP growth which is kept at 7% for 10 years, will be doubled. We will calculate chances of having doubled GDP based on the GDP growth from 2008 to 2018 in this report.

Graph 2: Historical Korea Annual GDP (https://tradingeconomics.com/south-korea/gdp)

In 2008, Korea GDP was initially 1002.22 Billion USD and went up to 1530.75 Billion USD in 2017. The growth was about 52% which is lower than the expected GDP growth in the plan.

Method

Graph 2: Historical Korea Annual GDP (https://tradingeconomics.com/south-korea/gdp)

According to the data, the lowest GDP growth rate was -2% for past 10 years and highest growth was about 8%. For the lowest growth, in 2008, there was Global Financial Crisis, which is uncommon factor resulted in affecting the project in negative side. We ignore the external sources and assuming that the growth rate is normal. Being more generous, we are assuming that mean of annual growth rate is 5% with standard deviation 2%.

We are only tracking the annual growth result and checking whether the project was successful or not. The value of insufficient GDP will be generated and if the project is successful, then the output will be 0. We have 10000 trials and finding the estimated probability of having successful probability by counting the number of output with the value 0. We simulate this model using SIP Math Modeler Tools in Excel.

Result

Year	GDP (Billion USD)	Changes in percentage(%)	Changes applied
2008	1002.22	5.212627049	1054.461991
2009	1054.461991	6.049348298	1118.250069
2010	1118.250069	-0.262809874	1115.311198
2011	1115.311198	4.915924813	1170.139058
2012	1170.139058	7.100991512	1253.230533
2013	1253.230533	3.184228632	1293.136258
2014	1293.136258	6.65604702	1379.208016
2015	1379.208016	0.652867307	1388.212414
2016	1388.212414	5.406969324	1463.272633
2017	1463.272633	3.412677009	1513.209402
2018	1513.209402	3.050369006	**1559.367873**
Number of Months over 7% growth			**1**
Insufficient Growth (Billion USD)			**440.6321275**

Initial Conditions		**Assumptions**		
Initial GDP	1002.22	Mean Growth	5	(%)
		Standard Deviation	2	(%)
		Normal		
Aim GDP	2000			
Counting Successful Project with 10000 trials	59			
Probability of having successful Project	0.0059			

Year	GDP (Billion USD)	Changes in percentage(%)	Changes applied
2008	1002.22	4.649975822	1048.822988
2009	1048.822988	6.09875658	1112.788149
2010	1112.788149	4.196595752	1159.487369
2011	1159.487369	9.842228272	1273.606762
2012	1273.606762	3.096036825	1313.038097
2013	1313.038097	3.569638757	1359.908814
2014	1359.908814	4.632438083	1422.905747
2015	1422.905747	3.481767655	1472.448019
2016	1472.448019	4.151842291	1533.581739
2017	1533.581739	7.695153345	1651.593206
2018	1651.593206	4.517605316	**1726.205668**
Number of Months over 7% growth			**2**
Insufficient Growth (Billion USD)			**1726.205668**

Initial Conditions		**Assumptions**		
Initial GDP	1002.22	Mean Growth	5	(%)
		Standard Deviation	2	(%)
		Normal		
Aim GDP	2000			
Mean	1712.375			

Overall, number of counts is usually around 55 out of 10000 trials. Estimated probability of having successful project, in other words probability of Korea GDP rise up to 2000 Billion USD at 2018 was 0.0055 (0.55%). The pledge Korea Government have made was not convincible referring to the performance of recent 10 years.

We have calculated the mean growth of GDP in another excel spread sheet and found that the mean of estimated GDP at 2018 is 1715 Billion USD, which is under target value. In order to have doubled GDP in 10 years, GDP growth should be 7% on average for 10 years.

Considering that maintaining larger than 7% annual growth is 16% and actual mean of annual growth was about 3% from 2008 to 2018, excluding the years affected by Global Financial Crisis, the pledge was not reasonable.