

# Solow growth model: japan



According to Solow Growth Model it allows us a dynamic view of how savings affects the economy over time.

The Solow Growth model is a dynamic model that allows us to see how our endogenous variables capital per worker and output per worker are affected by the exogenous variable savings. Further it also indicates that how parameters such as depreciation enter the model, and finally the effects that initial capital allocations have on the time paths toward equilibrium, which can be clearly visible and interoperated with the graphical representation of Solow growth Model.

Where production function  $Y/L = F(K/L)$ , rearranged to  $y = f(k)$ , which is the red curve on the graph. From the production function; output per worker is a function of capital per worker. The production function assumes diminishing returns to capital in this model, as denoted by the slope of the production function.

WHERE:

$n$  = population growth rate

$d$  = depreciation

$k$  = capital per worker

$y$  = output/income per worker

$L$  = labor force

$s$  = saving rate

Capital per worker change is determined by three variables:

Investment (saving) per worker

Population growth, increasing population decreases the level of capital per worker.

Depreciation – capital stock declines as it depreciates.

The Solow growth model can be described by the interaction of five basic macroeconomic equations:

Macro-production function

GDP equation

Savings function

Change in capital

Change in workforce

As per the Solow Growth Model the Short, Medium and Long term impact on Japan's in terms of capital per capita, income per capita, economic growth and consumption per capita after the recent earthquake and tsunami

### **Short Term Impact on Japan's Capital Per Capita, Income Per capita, Economic growth and consumption per capita after Tsunami:**

Japan real GDP growth is cut down by 0.4% per cent.

Japan's economic growth is forecast to be reduced by 1.5 percentage point this year due to the country's production disruptions from the deadly earthquake

Worst fall to 5% in Tokyo Stock Exchange

The loss of hundreds of trillions in Japan. The Nikkei-225 index fell below the level of 10,000.

Oil prices dropped nearly U.S. \$6 per barrel in line with fears of investors to the impact of earthquake and nuclear crisis that will drop the Japanese economy.

Earthquakes will lead to real GDP growth slowed sharply in first half of 2011; due to more people to tighten the money bags, consumer spending will be cut.

Loss ratio of capital stock is 14.7%

Economic loss is between \$120-230 billion. This is equivalent to the 2.5-4 percent of the Gross Domestic Product of Japan.

Earthquake caused total losses of about 12.7 trillion yen

With the loss of capital stock to be reset, appears equivalent to 12.7 trillion yen expected (about 2.6% of nominal GDP) long-term reconstruction needs.

Fiscal 2011 supplemental budget will provide the affected reconstruction of 6 trillion yen in additional expenditure

Government of Japan is going to spend in fiscal year 2010 budget's emergency reserve, subsequently approved the expenditure of 30.2 billion yen, provision of Iwate, Miyagi and Fukushima areas of drinking water, clothing, medical supplies and commodities.

In near future Japan exports to China could be affected, especially electrical machinery and machinery industry. Last year Japan imports totalled US \$ 176.8 billion (12.7% per cent of total imports), of which about half is electrical machinery, and mechanical products

Concerns about the safety of nuclear power plants and power shortages are likely to lead to other non-nuclear energy (such as thermal power) and the rise in food prices or will further pressure on Country.

Short term financial loss in Japan is bound to affect other nations also, as the international financial market is very much sensitive to economic losses in leading economies.

Appreciation in Yen, which is very likely, and decline in the foreign trade in Japan is expected to have implications on economies of other countries also.

Northeastern part of Japan has been badly affected due to earthquake and tsunami and this is the region which is considered as major base for many auto production companies. After earthquake and tsunami, many auto manufacturers of Japan have shut down their units in this region. Apart from auto plants, steel plants have also been affected adversely due to earthquake and tsunami.

The impact of the crisis will lead to deterioration in the state of Japan's public finances. The Japanese government will be faced with increased spending, while implementing tax reforms, including the hike of consumption tax, will become more difficult. This should eventually lead to upward pressure on the longer end of the yield curve. In situations of economic risk in the past, the Japanese government bond yield curve has tended to flatten, but markets reacted differently this time. While shorter dated bond yields declined, longer dated bond yields rose.

Nuclear crisis and its impact on health through a spreading contamination of food and the atmosphere with radiation could also dampen consumer spending, economists said — though, again, to what extent is difficult to gauge.

Radiation above legal limits has also been found in vegetables, milk and tap water in areas outside the 20 km (12 mile) evacuation zone around the nuclear complex, and an extended crisis would increase concerns about food. Worries about atmospheric contamination, even if unfounded, could incline people to stay home rather than eat out or entertain

People would find other ways to consume and spend their money. Maybe people would spend more in health or they might start buying cars because they don't like walking on the streets

Travel, tourism and trade would also be affected.

Several countries have already banned milk and produce from areas near the damaged nuclear plant because of contamination fears, although food makes up only 1 percent of Japanese exports.

Serious risk to an economy already burdened with huge public debt, an aging population and a big bill to rebuild from a quake and tsunami disaster that caused damages possibly topping \$300 billion.

### **Medium Term Impact on Japan's Capital Per Capita, Income Per capita, Economic growth and consumption per capita after Tsunami:**

The reconstruction efforts after earthquake would definitely boost the economy of Japan and would help in making fast recovery. It is expected that after one year, the imports of Japan would reach the pre-earthquake levels. As far as exports are concerned, about 80% of export level would be attained in a year.

Japan's public debt is approximately 200% of GDP, or roughly twice the level of the U. S. debt relative to GDP. In addition, the Japanese economy, even before the disaster, was in weak condition, and the political system has been dysfunctional. It was a particularly bad time for an unprecedented triple-punch disaster to strike.

Japan has to deal with the damage already inflicted, including the permanent closure of the Fukushima Daiichi nuclear plant. There are two aspects to this damage. The first is within the region, and it includes damaged or destroyed buildings, roads, and other infrastructure. The affected region comprises about 6.5% of Japanese GDP.

Discretionary consumption might be weak for some time as Japanese consumers become increasingly risk averse. Additionally, companies partially owned by the government may feel pressure to spend money to augment public works spending.

Earthquake and tsunami, which resulted in a 25 percent drop in Japanese visitors

The decline in Japanese vacations to Hawaii shrinks the amount of their money spent and taxes collected in the state.

The council's new estimates add \$312 million to its previous prediction of a nearly \$1 billion shortfall through June 2013.

### **Long Term Impact on Japan's Capital Per Capita, Income Per capita, Economic growth and consumption per capita after Tsunami:**

In terms of impacts on the Government's long-term development strategy, the tsunami has reinforced the established policy of encouraging voluntary population movements to less vulnerable islands, which has now assumed even greater urgency than in the past.

This policy aims to mitigate the risks of future tsunamis and rising sea levels, help realize economies of scale in the provision of public and private services in the atolls, strengthen service quality in the atolls, improve welfare, and help retain the population in the atolls.



The government has made a commendable effort to provide swift relief to the affected and is now engaged in planning and executing a reconstruction program.

Reconstruction of public assets and restoring lost government revenue will require financing of \$364 million, most of which will need to come from external sources in grants and highly concessional loans. This document spells out in some detail the physical damage and human suffering caused by the tsunami, the recovery strategy, and financing needs.

Longer term, the rebuilding process will have positive effects on Japan's economy which still hasn't fully recovered from an economic recession that began in the 1990's. The earthquake-tsunami that occurred on March 11, 2011 will have a negative impact short term on the Japanese and world economy but these effects should not persist long term.

The tsunami will have a major impact on the Japanese economy, much of which will become manifest over the next 18-24 months. The most likely effects include: a severe economic slowdown with low real GDP growth of about 4% of GDP, a doubling of the current account deficit from 12% of pre-tsunami GDP to 25%, and a significant widening of the fiscal deficit to about 11% of GDP.

Employment has been adversely affected by the low tourism occupancy rates and the losses of fishing vessels, equipment, agricultural crops, and other productive assets. Banks will need to reschedule loans to many of their clients and ensure adequate finance for ongoing operations and rebuilding.

Overall, the reconstruction effort is likely to encounter constraints in timely financing, and there are potential bottlenecks in transportation and labor.

Lack of electric energy will have a direct impact on industries that absorb a lot of electricity, such as steel and automotive industries. Due to its indirect occur in industrial derivatives, such as spare parts and other supplies, which come close due to upstream industries closed. Rolling blackouts are also done not only in areas affected by the earthquake, but in about 13 prefectures, which contributes about 42% of the GDP of Japan, and became Japan's leading industrial base, such as Sony, Toyota, Nippon Steel, etc.. In the worst case scenario, if the whole industry will reduce the capacity of its operations until several weeks after the disaster, its impact to GDP is estimated to be significant. This means that the Japanese economy will weaken.