APIR Discussion Paper Series No.35
2013/6

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A Counterfactual Analysis

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Abstract

This study is an attempt to assess the impact of policy initiatives launched by Japan's new Prime Minister Shinzo Abe on Japan's real GDP in his first quarter in office. We use as a benchmark for measurement a counterfactual estimate of GDP. Since the Japanese economy is also in the midst of reconstruction from the 2011 Tohoku disaster in the first quarter of 2013, we first estimate the counterfactual GDP which would have materialized in the absence of that disaster. We will use a dummy variable method and the statistical method proposed by Cheng Hsiao and others. We check the validity of these methods with regard to the Kobe earthquake of 1995, and then estimate the post-disaster counterfactual GDP for the Tohoku disaster. We measure the impact of government policies as the difference between the actual and counterfactual GDP. By doing so, we conclude that government policies have failed to lift Japan's GDP to the expected level. Even with the help of Abenomics, the gap remains in the rage of 3 to 13 trillion yen per year.

Keywords: Abenomics, Counterfactual Analysis, Post-Disaster Reconstruction, Quarterly GDP

* Thanks are due to James Brady who made this essay more readable.
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1 The Abenomics Hype

When Shinzo Abe retook office as Japan's 96th prime minister on December 26, 2012, he placed at the top of his policy agenda the task of pulling the Japanese economy out of the deflationary stalemate. A slower growth and moderately decreasing consumer prices had been plaguing the country for more than two decades after the bubble burst in the early 1990s. He proposed a bold new set of economic policies which have come to be called "Abenomics."

The policy program consists of "three arrows," a well understood reference to a legendary saying of a certain medieval lord to his three sons: a bundle of three arrows is unbreakable even though each one individually may be snapped. Prime Minister Abe's three arrow agenda consists of: 1) putting pressure on the Bank of Japan (BOJ) to launch an unprecedented monetary easing, 2) a deficit-financed budget with a focus on public works spending, and 3) a deregulation program for growth to encourage private investment.

With regard to the first policy goal, Prime Minister Abe approved the appointment of a new governor, Haruhiko Kuroda, to lead the BOJ. Mr. Kuroda announced that he would pursue a policy of quantitative easing of a "different dimension," to steer the economy onto a moderately inflationary path with an annual consumer price index increase of two percent, to be achieved within two years of the beginning of his tenure[1].

One aspect of the new governor's monetary policy was to devalue the yen to favor Japanese exporters. This policy, combined with Kuroda's "ability to communicate with the market"[2] and his swift actions, gave a boost to Japan's capital markets. Stock

[1] This was formally approved ata BOJ's Monetary Policy Meeting. See BOJ, "Launching a Quantitative and Qualitative Monetary Easing Policy," April 4, 2013.

[2] The Wall Street Journal, "Communication Skills Boosted BOJ Governor Nominee," March 1, 2013.

prices rose by 46 percent during the first five months of 2013[3], and the rate of increase in land prices, while still negative, is coming closer to zero in large cities[4].

In academia, the bureaucracy and financial institutions, people started to talk about the confidence and expectations instilled by Abenomics. They point to the possible channels through which the capital market hype will trickle down to the markets for goods and services; the collateral effect and the asset effect[5]. With improved balance sheets, companies would be willing to invest in plant and equipment because they could afford to take larger risks. Besides, the real interest rate is expected to go down even further.

Secondly, the expansionary monetary policy would be matched by expansionary fiscal policies. The Abe administration proclaimed that the government would keep the target for fiscal re-balancing unchanged by cutting expenditures and raising the consumption tax rate in 2014. However, it is far more important for them to increase fiscal spending on infrastructure investment for the purpose of building a society that is physically resilient against natural disasters. The parliamentary debate over the basic law to implement the policy is about to begin.

The third arrow in Abe's quiver is a package of growth promoting policies. The core of the policy consists of a program of reforms to foster more flexible employment of productive resources, ideas and human capital[6].

Controversy has erupted over the Abenomics program, involving not only the LDP and the opposition parties but also such international bodies as the OECD and the IMF. Those who support Abenomics see it as a bold new treatment that other advanced

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[3] The Nikkei started from 10,398.61 on January 4 and rose to 15,627 on May 22, then it came down to 12,289 on June 12. The high volatility in the stock market seems to reflect uncertainties with regard to Abenomics as well as in international economic conditions.

[4] Japan Real Estate Institute, May 28, 2013.

[5] This was first pointed out in the context of post-bubble Japanese economy by Hoshi and Kashyap (1999).

[6] In the speech delivered on June 5, PM Abe gave an outline of his growth plan. Stock market responded by the third largest fall in the year.

countries should learn from[7]. However, critics of the package see it as a mere red herring creating artificial exuberance in the asset market without expansion in the real sector and the labor market[8].

The debate is being carried out in terms of expectations, speculations, conjectures, and promises, which is unavoidable because we still do not have the necessary statistical data to support one view or another. Monthly statistics are starting to come in, concerning prices, industrial production, housing starts, the effective ratio of job offers to applications and the like. However, in order to assess the overall impact of Abenomics, we need GDP figures, which are slow to be published. The government published a second preliminary estimate of GDP for the first quarter of 2013 (13Q1) on June 10.

Although a decisive verdict is not possible because of the limited availability of data, we would like to propose, in this essay, a new methodology to make a quick assessment of Abenomics. According to our results, Japan's quarterly GDP fell short of the level which would have materialized had the Tohoku earthquake and tsunami not occurred – that is, the counterfactual GDP. We estimate that the gap between the actual GDP and the counterfactual GDP as being between 3 and 13 trillion yen per year, depending on the method of estimation.

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[7] Examples are Joseph E. Stiglitz (2013) and Paul Krugman (2013).

[8] For a ruthless critique, see Noriko Hama (2013).

2 Methodology

2.1 Counterfactuals as a Benchmark

In order to assess the contribution made by a policy program such as Abenomics, we need a benchmark against which to measure the net effect. The common procedure is to use the value of variables prior to the introduction of a program and measure the change as the difference tween them. This simple approach lies behind often-heard comments that business indices are a certain percentage up or down from the same quarter in the year before.

According to this convention, one could argue that Abenomics increased Japan's quarterly GDP from 518.0 trillion yen in 12Q4 to 522.6 trillion yen in 13Q1, a 4.6 trillion yen increase. However, this is based on the implicit assumption that the pre-treatment state of the economy would have stayed unchanged in the absence of Abenomics. In fact, an economy is buffeted by external and internal disturbances all the time with or without policy changes.

This naïve assumption becomes misleading when we try to measure the impact of a major change in policy variables (regime change) and try to assess their effects over a prolonged period. Ideally, we should be able to observe the history that would have unfolded in the absence of the policy change, but naturally, that is impossible. To overcome this problem, Hsiao, Ching and Wan (2012) developed a methodology to estimate the counterfactual movement of GDP growth using panel data analysis. Their aim was to measure the impact of two policy decisions which affected Hong Kong's growth rate; the decision to reunite Hong Kong politically with mainland China, and the economic decision for a greater economic integration in both regions.

Their method is quite ingenious and simple. They used a panel data that consist of countries and years, and found a statistical relationship between the growth rates of Hong Kong and those of other selected countries. Based on this finding, they predicted

what the Hong Kong growth rate would have been in the absence of the political and economic policy changes[9].

In the following sections, we employ a similar methodology to assess the extent of the contribution made by Abenomics. The benchmark is the counterfactuals of what Japan's GDP would have been without Abenomics. However, in the present case there is an additional conceptual difficulty: the "triple disaster" of March 2011.

2.2 Disentangling Disaster Recovery and Abenomics

The northeastern part of Japan was hit by a massive earthquake and tsunami on March 11, 2011. These natural disasters were followed by the Fukushima nuclear power plant accident. The combined direct economic damage of the triple disaster was estimated at 18 trillion yen or 6% of nominal GDP by the government[10]. When Prime Minister Abe took office, Japan was in the midst of the post-disaster reconstruction, with the recovery program expected to take at least five years to complete.

Thus, the difficulty is how to disentangle the effects of disaster reconstruction and the additional contribution of the Abe policy regime. We propose to solve the problem by studying the case of the 1995 Kobe earthquake and the changes in GDP that resulted from it.

2.3 The Kobe Earthquake and Its Aftermath

2.3.1 A Dummy Variable Approach

The Kobe earthquake occurred on January 17, 1995. More than 6,400 people died in and around the highly developed city of Kobe, and the economic loss of capital stock amounted to almost 10 trillion yen, or 2 % of Japan's annual GDP. From earlier studies, we know that it took three years for the national economy to complete post-disaster

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[9] They concluded that the political integration had had hardly any impact on the growth of the Hong Kong economy, whereas the economic integration raised Hong Kong's annual real GDP by about 4%.

[10] Estimated direct damage figures ranged over 18 to 30 trillion yen. See Mampei Hayashi (2012).

reconstruction[11]. We would like to infer how Japan's GDP would have fared had the Kobe earthquake not occurred.

Following the conventional approach, first we first tried to find whether there was any structural disturbance in Japan's GDP between 95Q1 and 97Q4 (the disaster period) by a dummy variable approach. Using the OECD quarterly national accounts data, we tried to find a structural relationship between Japan's GDP and that of other countries. We used panel data for 40 countries for the period from 90Q1 to 99Q4[12]. We introduced a dummy variable, "hanshindummy", for the disaster period. The OLS result is shown as estimate (1) in Table 1.

The dependent variable is Japan's quarterly real GDP as reported and revised by the Cabinet Office. We found that GDPs of Canada, United Kingdom and Indonesia yielded the best regression result. The result shows that the estimated coefficient of the dummy variable was not statistically significant at the 95% confidence level. This implies that there was no significant structural change during the disaster period.

Moreover, the estimated coefficient of the "hanshindummy" is positive in sign, implying that Japan's actual GDP was higher than the level which would have occurred in the absence of the disaster. In order to calculate the counterfactual GDP, we subtracted the effect of the dummy variable from the predicted value of GDP based on estimate (1). We call the time series counterfactual (1).

2.3.2 Estimating Counterfactual GDP Using Hsiao's Method

Following Hsiao's method, we first estimate the statistical relationship between the dependent variable and independent variables that existed prior to the introduction of a policy change. This we do by using a longer observation period containing the disaster period, and by omitting observations pertaining to the disaster period. The

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[11] For the local economy of Hyogo Prefecture, and most notably the 11 cities that were hardest hit, recovery did not mean returning to the pre-disaster state, but instead embarking on a new development path. See T. Hayashi (2011).

[12] The data we use is quarterly GDP in the national currency which is converted to a volume index for each country so that they represent real GDP as reported by each country.

number of observations is reduced to 24. The OLS result is given as estimate (2) in Table 1[13].

Table 1 OLS Results for the Counterfactual Prediction

	Estimate(1)	Estimate (2)
canada	−307.1***	−294.3**
	(−4.28)	(−3.20)
unitedkingdom	177.2*	157.0
	(2.10)	(1.51)
portugal	1757.0***	1826.2***
	(7.12)	(7.13)
indonesia	0.0324***	0.0308***
	(5.99)	(5.19)
hanshindummy	2214831.9	
	(0.85)	
_cons	324022019.7***	323688635.4***
	(54.22)	(52.92)
N	40	24
adj. R-sq	0.965	0.963
observations:	90Q1−99Q4	90Q1−99Q4
excluding:		95Q1−97Q4

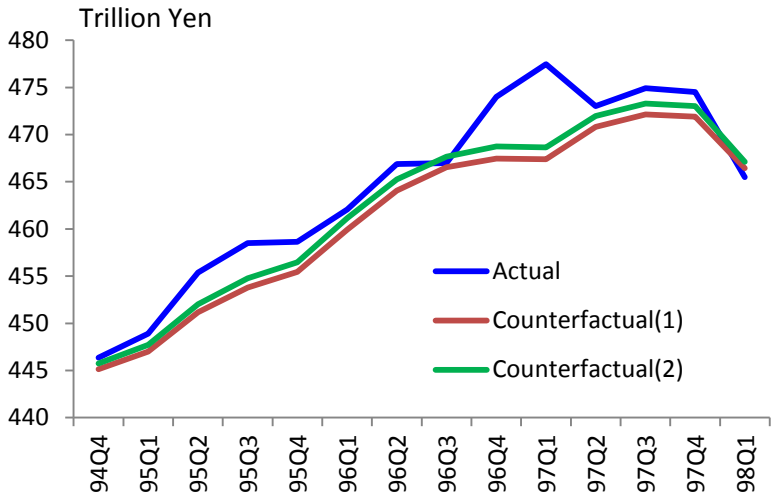
t statistics in parentheses; ＊ p < 0.05 ** p < 0.01 *** p < 0.001

Then, we predict Japan's GDP using this relationship over the entire observation period. We call this time series counterfactual (2). Counterfactual (2) represents Japan's GDP calculated on the assumption that the same structural relationship existed between Japan and those four countries during the period in which Japan was engaged in the disaster recovery process. In other words, counterfactual (2) is the GDP that Japan would have produced if the Kobe earthquake had not occurred.

Figure 1 illustrates the actual GDP and the two counterfactual series.

[13] We note in passing that the estimated coefficients for Canada are negative both in estimate (1) and estimate (2). This simply means that Canada's GDP and Japan's GDP were negatively correlated statistically during the observation period.

Figure 1 Post-Kobe GDP and Counterfactual GDP



Clearly the actual GDP stayed above the two counterfactuals during 95Q1 and 97Q4. The earthquake brought a devastating impact on the local economy. Production declined, jobs were lost, and a considerable number of surviving residents emigrated. This damage is sometimes referred to as the indirect effect of the disaster.

However, the impact of the disaster was insignificant at the national GDP level. This is because whatever losses the affected region suffered were more than offset by the reconstruction expenditures by both the public and private sectors[14]. This is in sharp contrast to the case of the Tohoku disaster, which we examine in the next section.

3 The Counterfactuals after the Tohoku Disaster

3.1 The Tohoku Disaster

Sixteen years after the Kobe disaster, the northeastern region of Japan (Tohoku) was hit by a disaster of an even greater magnitude – part natural, part man-made. The earthquake and tsunami of March 11, 2011 claimed almost 20,000 lives[15] and the

[14] This conclusion endorses the textbook argument that disasters boost GDP because post-disaster expenditures are counted in GDP figures while losses in capital stock are not.

[15] According to the National Police Agency, the number of victims confirmed dead is 15,883 and missing is 2,671 as of June 10, 2013.

subsequesnt nuclear power plant accident in Fukushima would leave a long scar on the economic landscape of the region for four to five decades to come. Table 2 summarizes a comparison between the Kobe and Tohoku disasters.

Table 2 The Kobe and Tohoku Disasters

	Kobe	*Tohoku*
Date	05.46 hours, 17 January 1995	14.46 hours, 11 March 2011
Magnitude	7.3	9.0
Affected Area	Urban area	Rural area
Tsunami	None	Height 8.0−9.3m, severe damage
Nuclear Accident	None	Fukushima, severe indirect damage
Damage	Infrastructure, buildings	Infrastructure, buildings
Casualties	6437	18554
Buildings Totally Lost	104906	130443
Direct Economic Damage	¥9.9trillion (2% of GDP)	¥30trillibn (6% of GDP)*

* Estimate by M. Hayashi (2011).

3.2 The Tohoku Counterfactuals

This time we chose observations pertaining to 00Q1 to 12Q4. We use the dummy variable “tohokudummy” for 11Q1-12Q4. The reason we truncate observations at 12Q4 is because we wish to obtain an estimate for 13Q1 in order to assess the impact of Abenomics in that quarter. After several rounds of iteration, we found that the combination of GDP figures for Belgium Canada, Italy, Korea, Norway, Spain, and the United Kingdom yielded the best result. The OLS result is shown as estimate (1) in Table 3.

Table 3 OLS Estimates for the Post-Tohoku Period

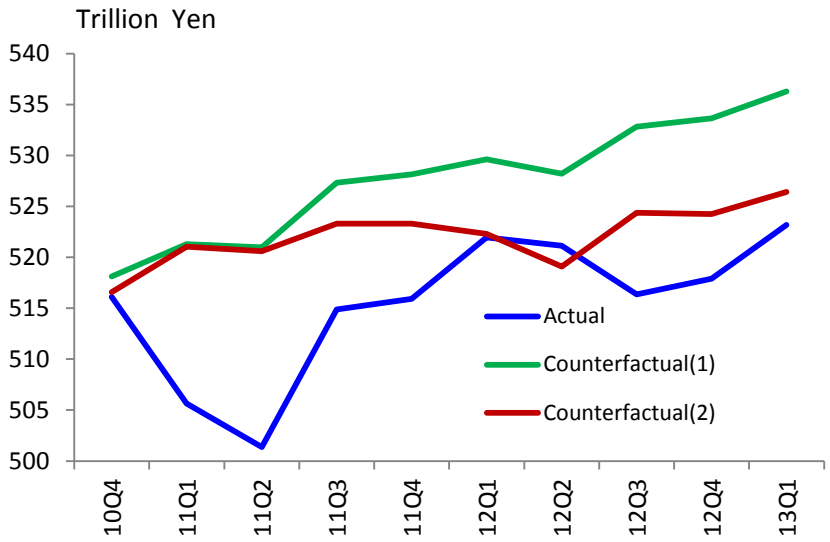
	Estimate (1)	Estimate (2)
belgium	1149.9***	1387.1***
	(4.37)	(6.58)
canada	90.70*	44.16
	(2.03)	(1.19)
italy	164.2***	144.4***
	(3.97)	(4.32)
korea	−0.0776*	−0.0729*
	(−2.30)	(−2.66)
norway	58.88*	−10.43
	(2.49)	(−0.43)
spain	−578.6***	−480.3***
	(−11.80)	(−9.75)
unitedkingdom	334.2***	347.3***
	(7.11)	−8.97
tohokudummy	−13355190.0***	
	(−5.17)	
_cons	−151836077.9***	−105228135.8***
	(−4.50)	(−3.75)
N	52	44
adj. R-sq	0.971	0.983
Ovservations:	00Q1−12Q4	00Q1−10Q4

t statistics in parentheses; * p < 0.05 ** p < 0.01 *** p < 0.001

We notice that the estimated coefficient of "tohokudummy" is negative, and it is statistically significant at the 99.9% level. That is to say, the Tohoku disaster had a significant negative effect on the national GDP over the disaster period. If we subtract the effect of tohokudummy by using the coefficient from the predicted GDP, we obtain counterfactual (1) for the Tohoku disaster.

Next, we obtained estimate (2) by using the same set of independent variables, and using observations for 00Q1-12Q4. The result is shown as estimate (2) in Table 3. Predicting over the entire observation period, we obtain counterfactual (2).

Figure 2 The Actual and Counterfactual GDP in Post-Tohoku Period



The effect of the Tohoku disaster is clearly visible from Figure 2, in which the actual GDP and the counterfactual GDP predicted by the above two models are illustrated. There is a sharp drop in actual GDP from the counterfactuals in 11Q1 and 11Q2, after which actual GDP picks up to 12Q1. However, actual GDP subsequently declined, before recording a slight increase.

4 Measuring the Effect of Abenomics

The final task is to measure the net effect of Abenomics. For that purpose, we compare actual GDP with the two counterfactuals in Figure 2. According to counterfactual (1), Japan's GDP should have been much higher without either the Tohoku disaster or Abenomics. The estimated GDP for 13Q1 is 536 trillion yen. Actual GDP is 523 trillion yen. Even with the help of Abenomics, we must conclude that actual GDP fell short of the counterfactual level by 13 trillion yen, or 2.5% of actual GDP.

Counterfactual (2) predicts that GDP should have been 526 trillion yen for 13Q1. Actual GDP is lower than this level by 3 trillion yen, or 0.6 % of actual GDP. Thus, we can conclude that Abenomics has not succeeded in raising actual GDP to the level that Japan would have seen if it had not suffered the Tohoku disaster.

5 Concluding Remarks

We wanted to separate the effects of post-disaster recovery and Abenomics. However, there is an intrinsic difficulty and conceptual ambiguity. The main reason for the ambiguity stems from the fact that we still do not know how the post-Tohoku reconstruction will proceed. Clearly the Tohoku reconstruction pattern is different from Kobe. If the new administration increases fiscal spending still further over the five-year period, Japan's GDP may rise accordingly[16]. However, what seems to be more important is the reconstruction of the disaster-affected Tohoku economy itself. If any government is successful in achieving this goal, it will become the matter of semantics as to whether or not one credits that achievement to the then-incumbent administration.

Secondly, if anything happened to GDP in 13Q1, it was prompted by expectations and anticipations. Since the BOJ announced the unprecedented monetary expansion only on April 4, the effects on the real sector will appear in 13Q2 and thereafter. The second arrow – flexible fiscal policy - is yet to be implemented, and the promised reform program has not yet been fleshed out. Prime Minister Shinzo Abe and his advisers intended to make use of the capital market as a springboard for sustainable growth with moderate inflation. As far as 13Q1 GDP is concerned, the jury is still out. It is anyone's guess as to whether or not his policy initiatives will have a lasting impact on GDP. Perhaps we will be in a better position to assess the impact of Abenomics more accurately in three months hence.

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