The Complementary Estimate of the Great East Japan Earthquake for the Labour Force Survey

Shinichi Nagao
Statistics Bureau, Tokyo, JAPAN
e-mail: s2.nagao@soumu.go.jp

Abstract

This paper provides the outline of the method and the results of the complementary estimate of the effects of the Great East Japan Earthquake on the Labour Force Survey (LFS) in Japan.

Japan's LFS was suspended in some areas due to the enormous damage caused by the Great East Japan Earthquake. Hence, results for these areas were excluded when the nationwide results were released from March through August 2011. After that, nationwide results were estimated from these areas' complementary estimate values.

*Keywords: Labour force, Great East Japan Earthquake, Complementary estimate

1. Introduction

The LFS is aimed at revealing, on a monthly basis, the current state of employment and unemployment of all persons usually residing in this country. This survey is carried out as a sample survey that targets the members fifteen years old or more in the household.

The East Japan great earthquake disaster that occurred on March 11, 2011 caused large-scale and extensive damage around the coast of Pacific in the northeastern part of Japan. The damage in Iwate, Miyagi and Fukushima Prefectures was enormous. Therefore, the LFS was suspended in these three prefectures. Hence, nationwide, expect for these three prefectures, results were released from March through August 2011. After that, nationwide results were estimated from the three counties' complementary estimate values. Estimates were based on other relevant available data, under certain assumptions, to reflect the facts about the disaster area as accurately as possible.

2. Analysis of the situation

Prior to examination of the estimation method, we analyzed the situation of employment and job seeking in the three prefectures after the earthquake from other relevant statistical data.

2.1 The number of insured person in employment insurance scheme

Under Japan's employment insurance scheme, all employers are obliged to enroll employees in the employment insurance system. However temporary workers and part-time workers who receive short-term contracts are not included among the insured.

The number of employment insured persons in any of the three prefectures declined significantly in April. In Iwate, the decrease reduced gradually. In Miyagi, it reduced much more quickly. On the other hand, in Fukushima, it

remained large due to the impact of the accident at the nuclear power plant caused by the earthquake disaster.
(Fig.1)

2.2 The number of regular employee

Monthly Labour Survey (MLS), is the sample survey that targets establishments, and aims to investigate the number of regular employee including part-time workers.

The MLS was suspended in the three prefectures' publication in March due to the extreme reduction of the number of sample caused by the earthquake disaster. After that, the publication of Iwate and Fukushima were resumed from May. That of Miyagi was resumed from June.

With respect to the number of regular employee in establishments with five or more persons, the averages from the month publication was resumed to August were a 3.8% decrease in Iwate, a 3.2% decrease in Miyagi, and a 8.9% decrease in Fukushima (all compared to the previous year). The number of employees working in establishments with one to four persons at the end of July 2011 showed a 4.0% decrease in Iwate, a 3.0% decrease in Miyagi and a 6.1% decrease in Fukushima (once again compared to the precious year).

2.3 Agriculture and Fisheries

In order to assess the situation of agriculture and fisheries after the earthquake disaster,　interviews were conducted on the Pacific coast of east Japan except Fukushima.

As of November 7, 2011, the farmers in Iwate that have damage were 14% of the total. Of these some 95% were to resume farming. The famers in Miyagi that have damage were also 14% of the total. Furthermore, of these only 34% were to resume faming. The fisheries in both Iwate and Miyagi that have damage were 100% of the total, and of these only 20% were to resume fishing.

Figure 1. Change in the number of employment insured persons in the three prefectures compared with a year before
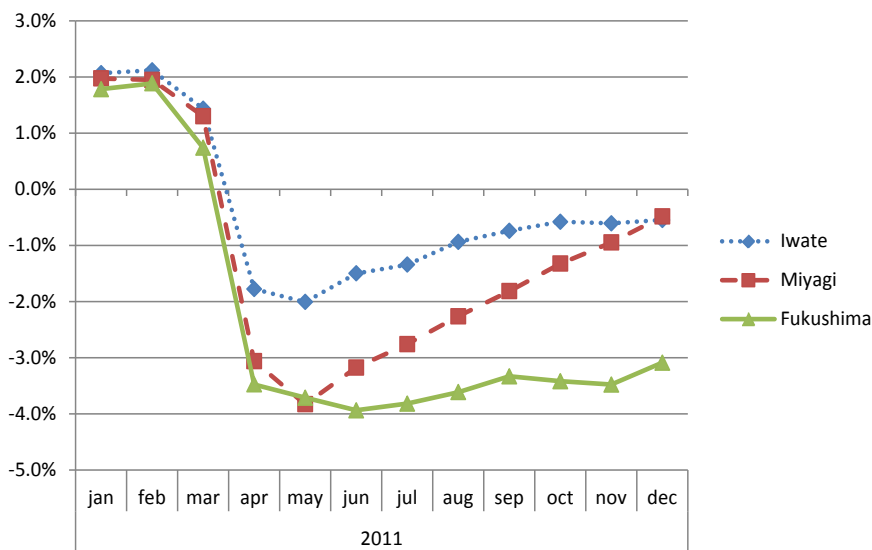
2.4 Job seeking through the Public Employment Security office

When seeking a job through the Public Employment Security Office (PESO), job seekers submit a job application at the office. This application is effective for up to two months after the date of receipt.

With respect to the number of effective job seekers through the PESO in Miyagi, both the width of the increase and the number of increase were larger than the other two prefectures, due to the inclusion of urban areas. The number in Iwate rapidly increased in April, but then gradually decreased. The number in Fukushima remained at a high level, however the width of increase and its changes were rather gradual.

3. Complementary estimate

Based on the above, the concepts of the estimate were as follows.

(a) First, we estimated the three prefectures for each month from March to August of 2011, after that, added these to the nationwide results except for the three prefectures which have already been published.

(b) The number of unemployed and the number of employed in the three prefectures were estimated independently. The number of not in labor force in the three prefectures is calculated by subtracting the number of unemployed and the number of employed from the population over the age of fifteen.

(c) Breakdown is calculated indirectly by apportioning the total.

3.1. The estimate of the number of employed

In the LFS, the employed are included in the employee, self-employed worker and family worker category. There was no data corresponding thereto at the time of the earthquake disaster.

Therefore, the estimation was carried out using the other available relevant data about employment. It assumed that there was a decrease in the number of employees in comparable year-on-year data allowing the reduction rate to be determined. In this fashion the year-on-year decrease in the number of employed persons was estimated.

The estimation formula is as follows.

[Non-agricultural and non-fishing]

$$\triangle D_n = D_{n-1} \times i_n \times (r_p / i_p)$$

$\triangle D_n$: Decrease in the number of employed from the same month of the previous year

D_{n-1} : Number of employed in the same month of the previous year

i_n : Decrease rate in the number of employment insured from the same month of the previous year

r_p : Decrease rate in the number of regular employees from the same period of the previous year

i_p : Decrease rate in the number of employment insured from the same period of the previous year

[Agricultural and fishing]

$$\triangle D^{af}n \quad = \quad D^{af}n\text{-}1 \times \quad NR_n$$

$\triangle D^{af}n$: Decrease in the number of employed from the same month of the previous year (agricultural and fishing)

$D^{af}n\text{-}1$: Number of employed in the same month of the previous year (agricultural and fishing)

NR_n : Non-resumption rate of agricultural and fishing

[Note]

The number of employed of the same month of the previous year was calculated based on the results of the LFS and the 2010 census.

Since the coverage of the employment insured is smaller than that of the regular employees, the estimation method was adopted to adjust the latter to the former.

Therefore, we organized the reference periods and synthesized coefficients.

With regard to the non-resumption rate of agricultural and fishing, we used the results of the interviews in Iwate and Miyagi to take into consideration the situation of the tsunami and nuclear accident evacuation in Fukushima.

3.2. The estimate of the number of unemployed

In this estimation, we decided to use the number of effective job seekers through the PESO because a correlation was found between the numbers of unemployed in the region. It was estimated based on the time-series model. These time series models were classical regression models.

The estimation formula is as follows.

$$\triangle Ut = \alpha \quad + \beta \triangle St \quad + \quad \sum \gamma i \quad d\,it$$

t   : Quarter

U : The number of unemployment

S : The number of effective job seeker through the PES

$\triangle Ut$: $Ut \quad - \quad Ut-1$

$\triangle St$: $St \quad - \quad St-1$

d i   : Dummy variable which is equal to 1 for the quarter

[Note]

The regression formulas were estimated using the data of the past three years   (from January-March quarter of 2008 to October-December quarter of 2010).

The estimates were calculated sequentially starting from October-December quarter of 2010.

SUMMARY OUTPUT and ANOVA in the three counties were as follows.

-Miyagi-

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.9320
R Square	0.8686
Adjusted R Square	0.7935
Standard Error	2.6161
Observations	12

ANOVA

	df	SS	MS	F	Significance F
Regression	4	316.7575	79.1894	11.5703	0.0033
Residual	7	47.9092	6.8442		
Total	11	364.6667			

	Coefficient	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	5.1858	1.8043	2.8741	0.0239	0.9193	9.4524
△S	1.6029	0.3260	4.9163	0.0017	0.8319	2.3739
d1	−4.5032	2.9735	−1.5144	0.1737	−11.5345	2.5281
d2	−19.5481	3.7604	−5.1985	0.0013	−28.4399	−10.6562
d3	0.2185	2.1365	0.1023	0.9214	−4.8336	5.2706

-Fukushima-

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.9345
R Square	0.8733
Adjusted R Square	0.8009
Standard Error	1.6641
Observations	12

ANOVA

	df	SS	MS	F	Significance F
Regression	4	133.6156	33.4039	12.0626	0.0029
Residual	7	19.3844	2.7692		
Total	11	153.0000			

	Coefficient	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	−0.2280	1.0534	−0.2164	0.8348	−2.7188	2.2629
△S	0.7163	0.1746	4.1029	0.0046	0.3035	1.1291
d1	2.5413	1.7399	1.4606	0.1875	−1.5728	6.6554
d2	−4.2628	1.8686	−2.2814	0.0565	−8.6813	0.1556
d3	2.4873	1.3639	1.8237	0.1110	−0.7378	5.7124

-Iwate-

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.9549
R Square	0.9118
Adjusted R Square	0.8614
Standard Error	1.3870
Observations	12

ANOVA

	df	SS	MS	F	Significance F
Regression	4	139.2006	34.8001	18.0900	0.0009
Residual	7	13.4661	1.9237		
Total	11	152.6667			

	Coefficient	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.2018	0.9528	0.2118	0.8383	−2.0511	2.4548
△S	0.8660	0.2393	3.6194	0.0085	0.3002	1.4317
d1	1.7473	1.8408	0.9492	0.3741	−2.6057	6.1002
d2	−3.1335	1.8150	−1.7265	0.1279	−7.4253	1.1582
d3	0.8616	1.2438	0.6927	0.5108	−2.0795	3.8027

3.3. The results of the estimate

Figure 2 shows the nationwide results, including the estimates of the three prefectures.

Figure 2. Comparison of Nationwide employment status include the three prefectures (estimated) and Nationwide without the three prefectures (published)

(ten thousand, %, point)

		Employed			Unemployed			Not in labour force			Unemployment rate		
		Nationwide include the three counties (estimated) ①	Nationwide except for the three counties (published) ②	Difference ①−②	Nationwide include the three counties (estimated) ①	Nationwide except for the three counties (published) ②	Difference ①−②	Nationwide include the three counties (estimated) ①	Nationwide except for the three counties (published) ②	Difference ①−②	Nationwide include the three counties (estimated) ①	Nationwide except for the three counties (published) ②	Difference ①−②
Actual figures	mar	6194	5928	266	320	304	16	4528	4317	211	4.9	4.9	0.0
	apr	6257	5994	263	327	309	18	4459	4247	212	5.0	4.9	0.1
	may	6282	6019	263	312	293	19	4451	4242	209	4.7	4.6	0.1
	jun	6265	6002	263	312	293	19	4466	4258	208	4.7	4.7	0.0
	jul	6241	5973	268	310	292	18	4493	4289	204	4.7	4.7	0.0
	aug	6238	5967	271	293	276	17	4490	4290	200	4.5	4.4	0.1
Change over the year	mar	−16	−13	−3	−30	−26	−4	50	44	6	−0.4	−0.4	0.0
	apr	−12	7	−19	−29	−30	1	48	31	17	−0.4	−0.5	0.1
	may	−13	9	−22	−35	−38	3	51	34	17	−0.5	−0.6	0.1
	jun	−15	3	−18	−32	−36	4	44	34	10	−0.5	−0.5	0.0
	jul	−30	−20	−10	−21	−23	2	52	47	5	−0.3	−0.3	0.0
	aug	−40	−29	−11	−44	−45	1	60	57	3	−0.6	−0.7	0.1

Looking at the changes of the nationwide except for the three prefectures results, the decrease in the number of unemployed has reversed itself since April, the increase in the number of not in labour force has expanded since March, the increase in the number of employed has reversed from April to June.

This result reflects the severe conditions of the employment and the unemployment in the three prefectures, such as an increase number of unemployed, decrease in the number of employed, and increase of not in labour force.

In addition, the decrease in the number of employed is significantly greater than the increase in the number of unemployed. As a result, the category "not in the labour force" has increased. Behind this is believed to be the fact that there were many cases where people could not seek for a job even though they had lost their job due to the extreme conditions in the affected areas.

4. Conclusion

This estimate was carried out in the supplemental under certain assumptions as possible on the need for supplement. In order to grasp the reality of the situation on the ground, the LFS is essential. The data obtained from LFS can't be replaced by other data. The estimation results are for reference. This estimation method is applied in a limited area and a limited period of time under special circumstances, and it can't be applied in other regions and periods.