

# How to Address Tail Risks

June 27, 2011

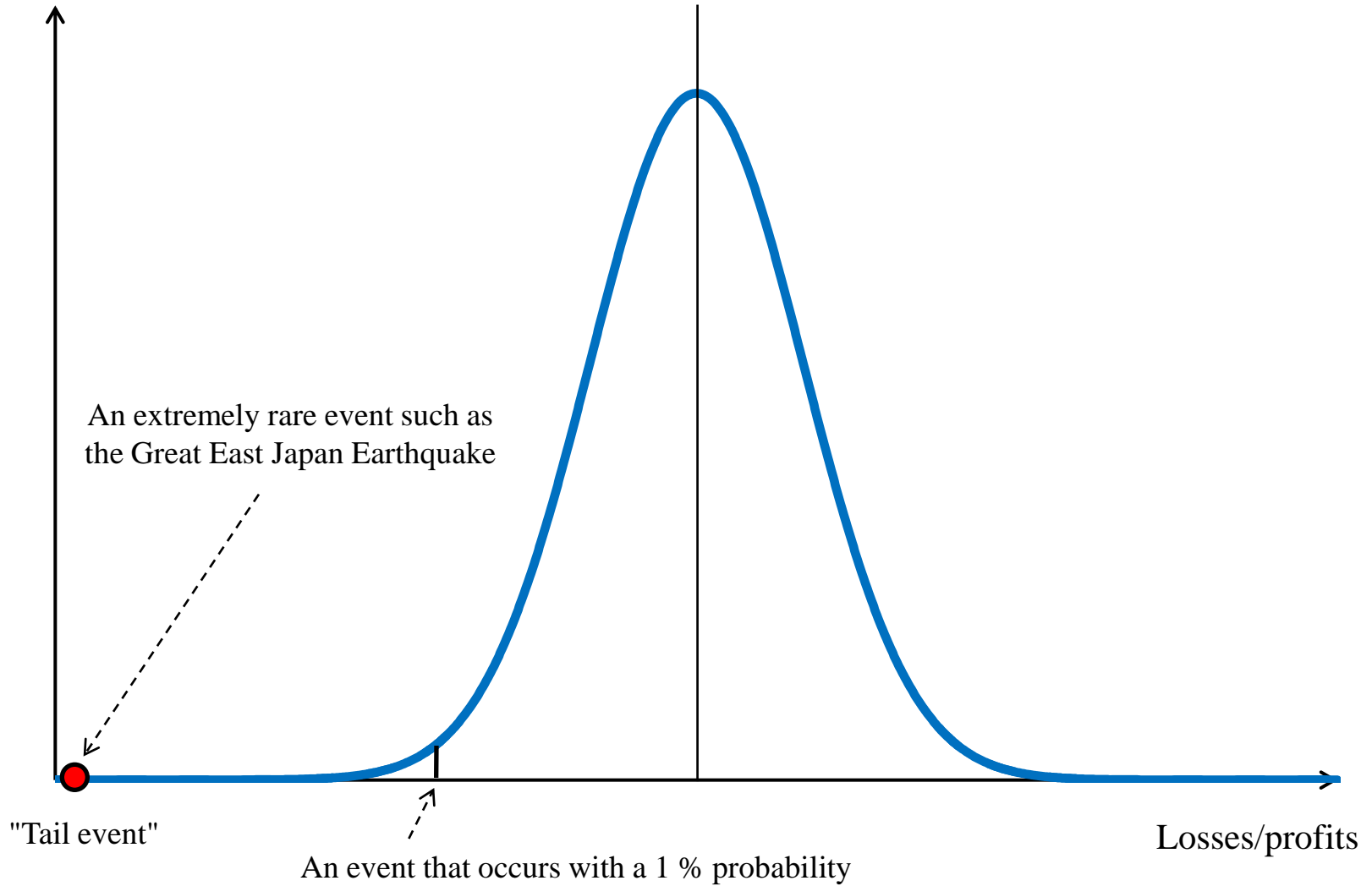
Annual General Meeting 2011 of  
the Foreign Bankers' Association in the Netherlands

**Masaaki Shirakawa**

Governor of the Bank of Japan

# Tail Events

Frequency of occurrence



# Tail Risks

Frequency of occurrence

$$\text{Tail risks} = \text{Losses} \times \text{Probability}$$

Amount of losses with the same probability varies by the distribution

Distribution 1  
(shorter tail)

Distribution 2  
(longer tail)

Tail risks

Difficult to specify the shape of the tail of the distribution

Losses ← → Profits

▲ 150

▲ 100

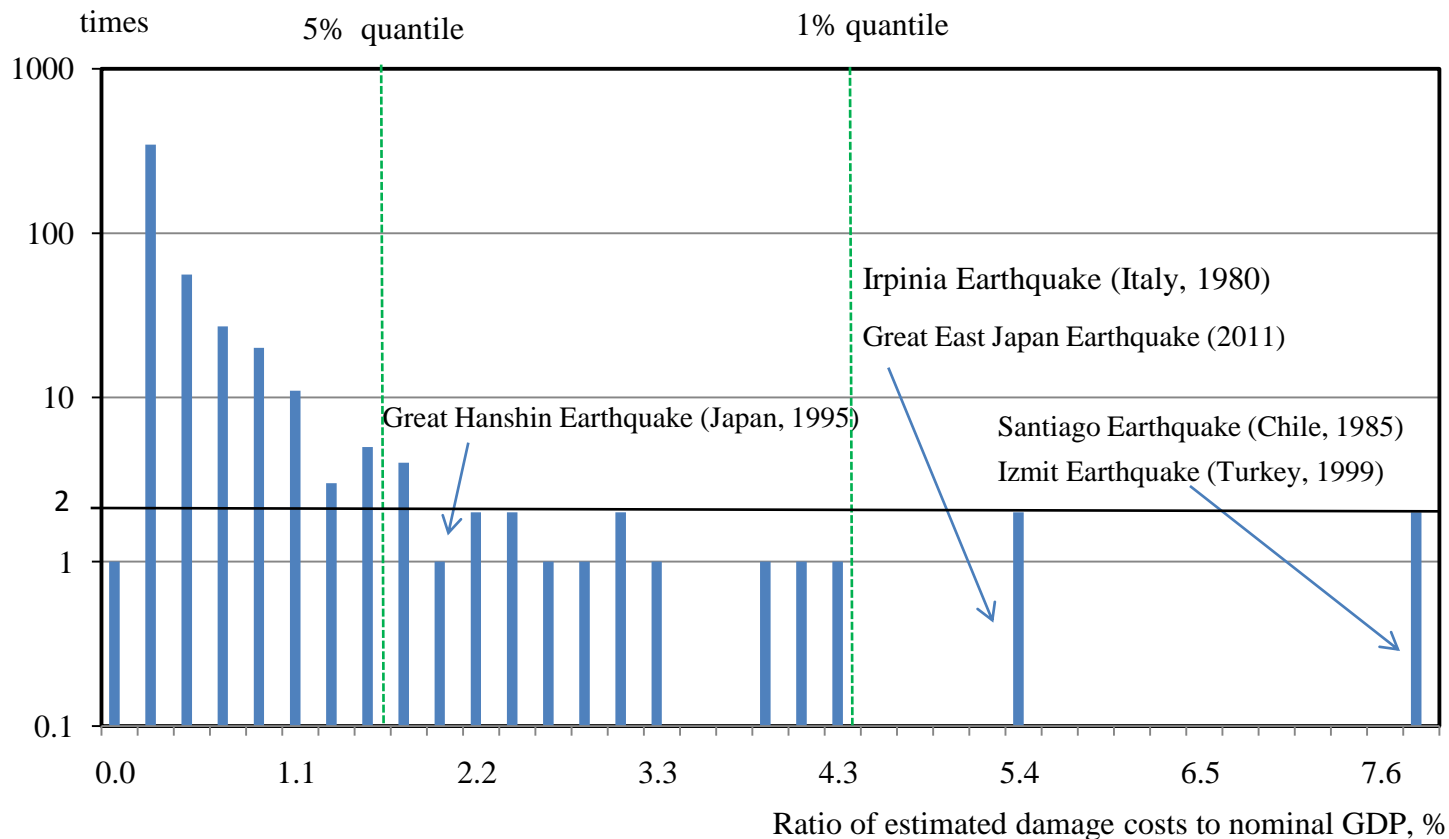
Losses/profits

1 % probability losses in the distribution 2

1 % probability losses in the distribution 1

Tail event

## Frequencies of Natural Disasters

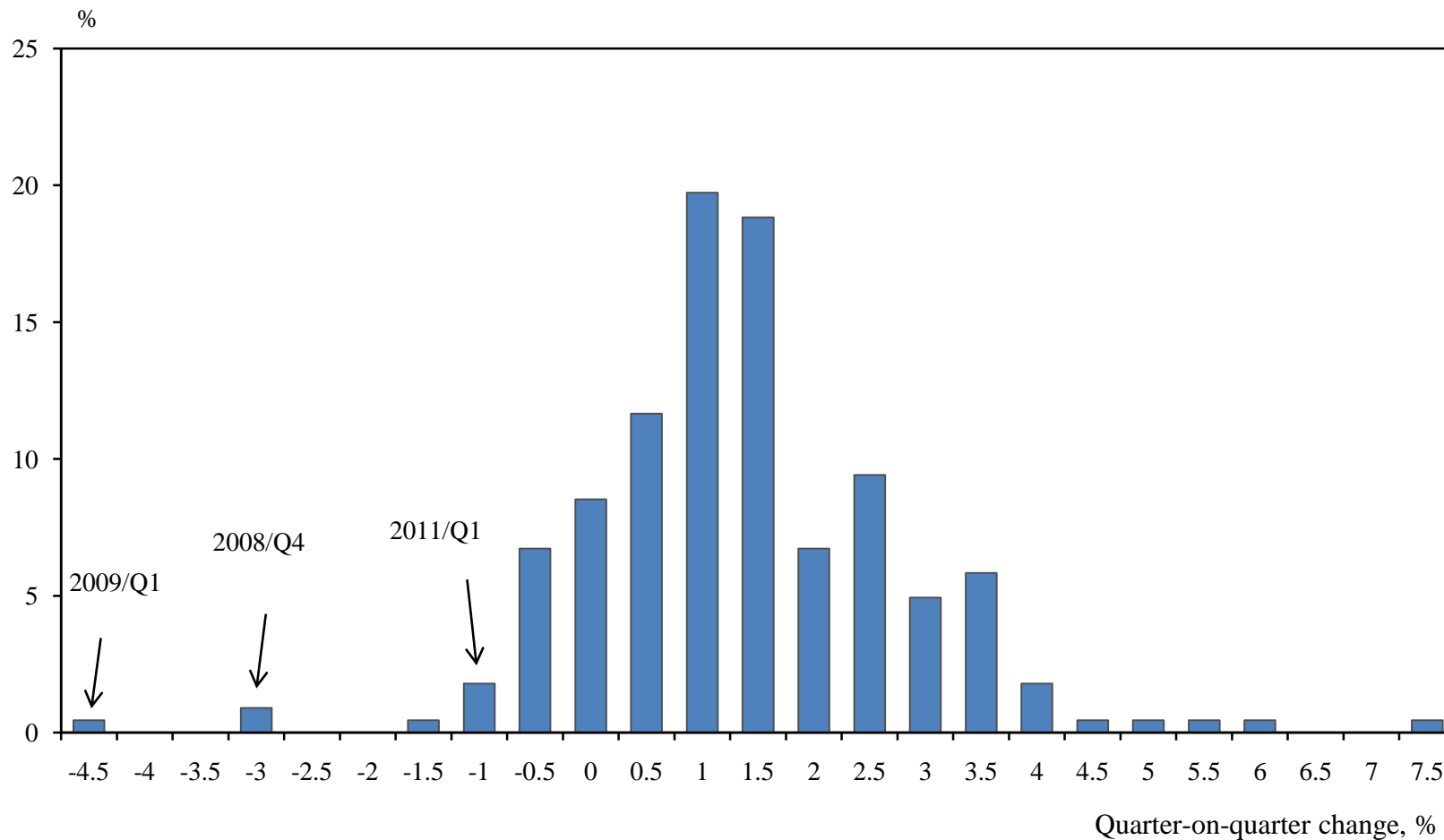


Notes: 1. The damage cost of the Great East Japan Earthquake is estimated by the Cabinet Office to be 25 trillion yen.  
It is converted into U.S. dollars at the exchange rate at the end of March 2011 (\$1 = 82.84 yen).

2. Damage costs include the damage to infrastructure, agricultural crops, and buildings.

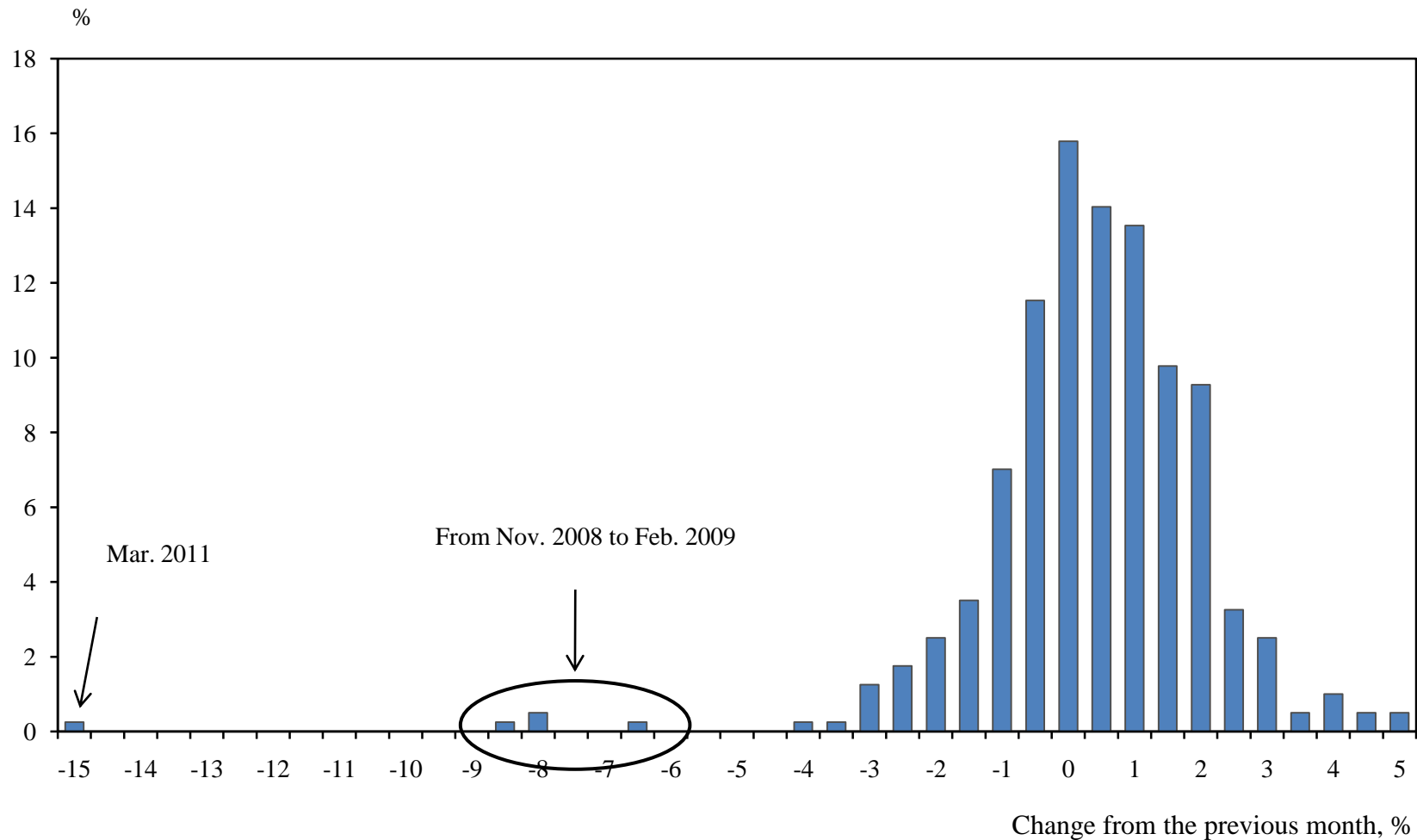
Source: Center for Research on the Epidemiology of Disasters, University Catholique de Louvain, "Emergency Events Database (EM-DAT)."

## Distribution of Quarterly Changes in Japan's Real GDP



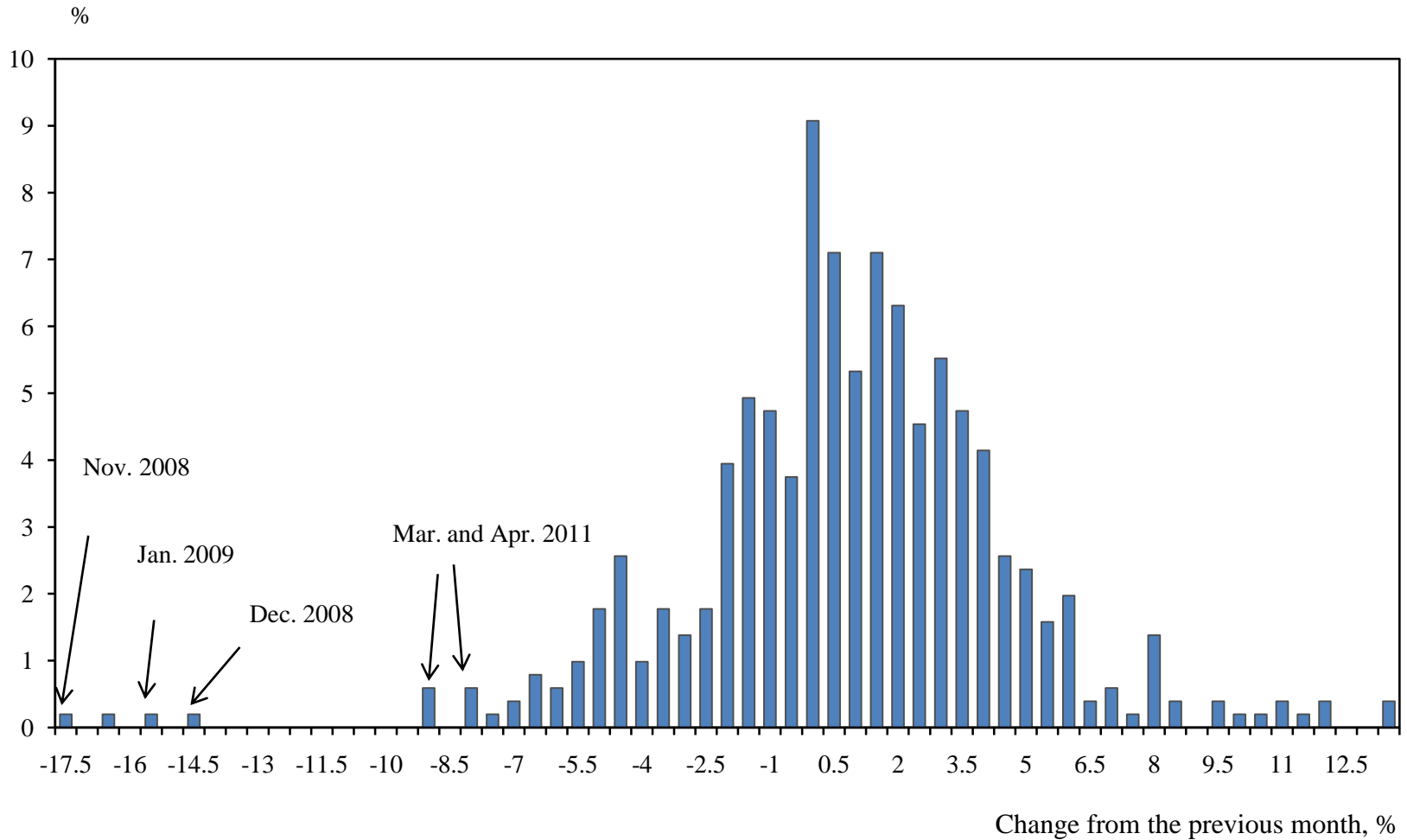
Note: Data from 1955/Q3 to 2011/Q1 are used.

## Distribution of Monthly Changes in Japan's Production



Note: Data from February 1978 to April 2011 are used.

## Distribution of Monthly Changes in Japan's Exports



Note: Data from February 1969 to April 2011 are used.

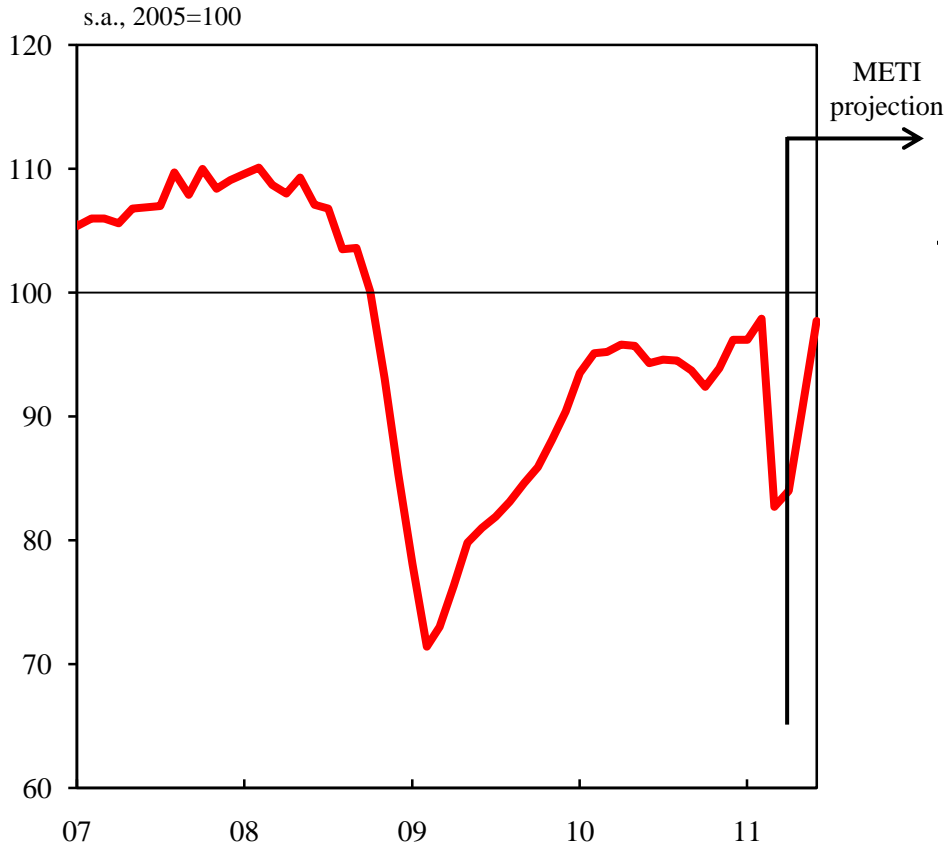
## Damage to Capital Stock

	Amount of damage to capital stock		
		Ratio to nominal GDP	Ratio to total capital stock
<b>Great East Japan Earthquake (2011)*</b>	<b>16-25 trillion yen</b>	<b>3-5%</b>	<b>1.4-2.2%</b>
<b>* Figures do not include the effects of the nuclear accident.</b>			
Great Kanto Earthquake (1923)	4.6 billion yen	29%	9%
World War II (1941-45)	64.3 billion yen	86%	25%
Great Hanshin Earthquake (1995)	9.9 trillion yen	2%	0.9%

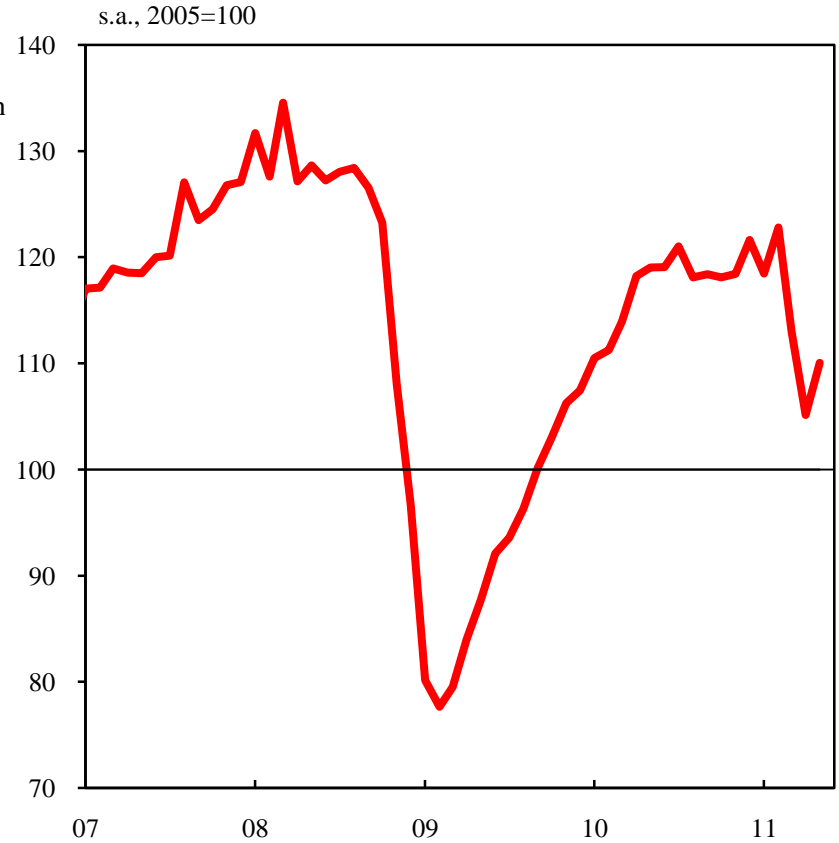


## Japan's Production and Real Exports

Production

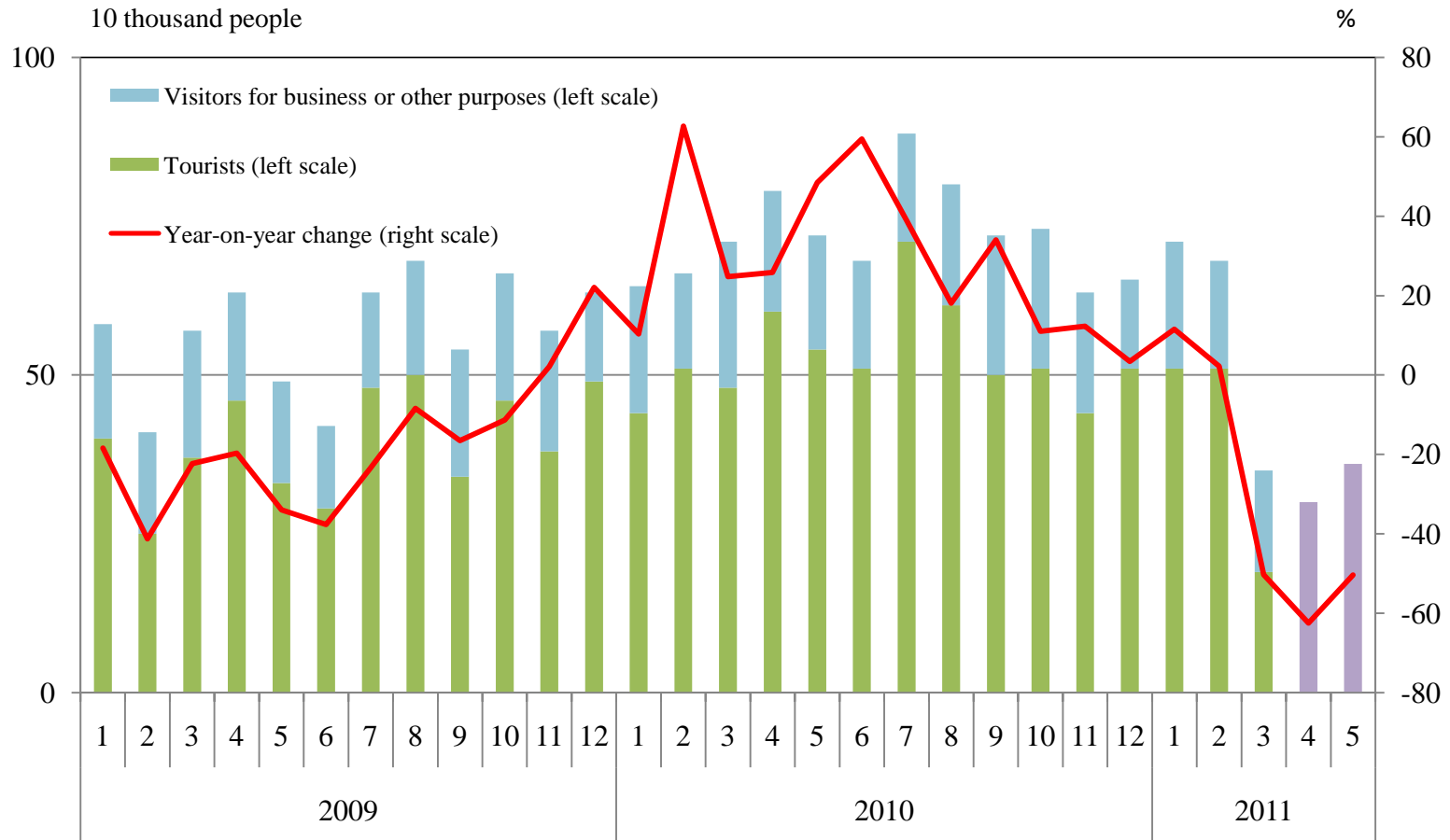


Real Exports



Sources: Ministry of Economy, Trade and Industry, "Indices of Industrial Production";  
Bank of Japan, "Real Exports and Real Imports."

## Number of Foreign Visitors to Japan

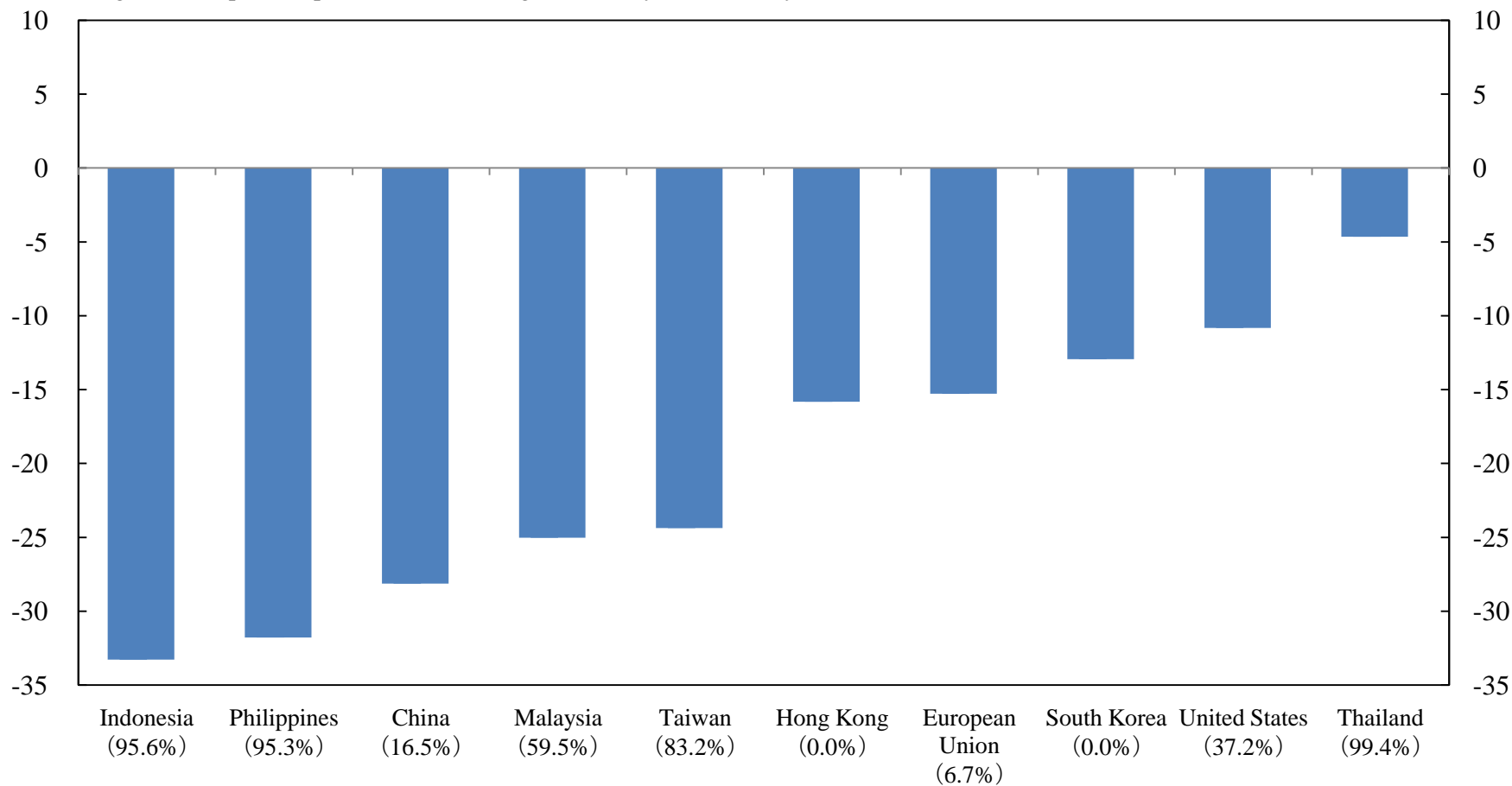


Note: Figures of April and May 2011 are estimates of the Japan National Tourism Organization, and a breakdown of the figures by purpose of visit is not yet available.

Source: Japan National Tourism Organization, "Visitor Arrivals & Japanese Overseas Travelers."

## Japan's Exports of Automobile Parts

Figures for April compared with the average of January and February 2011, %



Note: The parenthesized figure is the share of Japanese automakers in individual economies' automobile production.

## Nominal GDP, Land Size, and Population in the Prefectures Most Affected by the Great East Japan Earthquake

Share, %

	Ibaraki Prefecture	Miyagi Prefecture	Fukushima Prefecture	Iwate Prefecture	<b>Total</b>
Nominal GDP	2.3	1.6	1.5	0.9	<b>6.3</b>
Land size	1.6	1.8	3.6	4.0	<b>11.1</b>
Population	2.3	1.8	1.6	1.0	<b>6.8</b>

Notes: 1. Figures for nominal GDP are as of fiscal 2008. Those for land size and population are as of fiscal 2010.

2. Land size refers to land area as a percentage of Japan's overall size.

Sources: Ministry of Internal Affairs and Communications, "Statistical Handbook of Japan 2010," "Population Census"; Cabinet Office, "Kenmin Keizai Keisan Nenpo (Annual Report on Prefectural Accounts)."