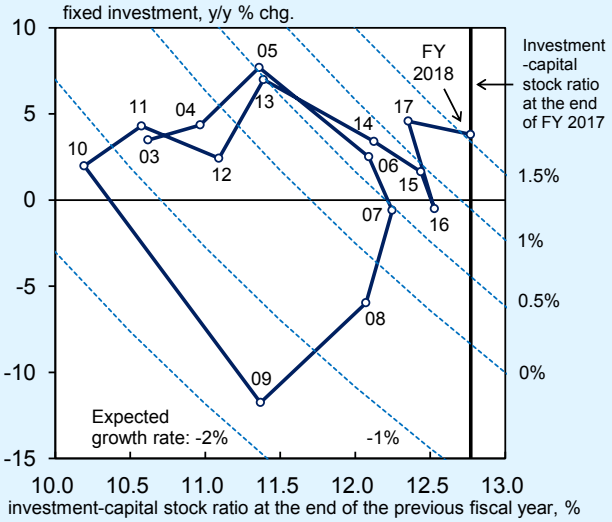
## (Box 2) Stock Adjustment Pressure on Business Fixed Investment

Business fixed investment has been on an increasing trend recently, and fixed investment plans for fiscal 2018 in the *Tankan* also show the rate of increase substantially exceeding the past average (Chart 21). Some are of the view that, if such strong fixed investment were to materialize, there would be a build-up of capital stock, which might push down investment from next fiscal year onward.

One way to quantitatively assess this adjustment pressure is with a capital stock cycle chart (Chart B2-1). This chart plots the link between the investment-capital stock ratio (at the end of the previous fiscal year) on the horizontal axis against the year-on-year rate of change in fixed investment on the vertical axis.[37] The chart indicates that the growth rate of fixed investment in the first half of fiscal 2018 is consistent with an expected growth rate of around 1.5 percent. Therefore, unless the expected growth rate substantially exceeds the potential growth rate, which is estimated to be in the range of 0.5-1.0 percent, the current growth rate of fixed investment will not be sustainable.

However, the capital stock cycle chart needs to be viewed with caution from many aspects. For example, estimating capital stock is difficult and involves measurement error. In addition, the cost

**Chart B2-1:** Capital Stock Cycles




Source: Cabinet Office.
Note: Each broken line represents the combination of the rate of change in fixed investment and the investment-capital stock ratio at a certain expected growth rate.
The figure for fiscal 2018 is the 2018/Q2-Q3 average.

[37] For details on the capital stock cycle chart, see "Kinnen no seizōgyō no setsubi tōshi zōka ni tsuite" [Increase in business fixed investment in the manufacturing sector in recent years], Bank of Japan Review Series (2006-J-17) (available only in Japanese).

of capital is not considered a determinant of fixed investment in the capital stock cycle chart. Therefore, on the basis of previous research, an investment function is estimated in this box, where capital stock is not used and factors such as the cost of capital are taken into account (Chart B2-2).[38]

In this function, the long-run equilibrium value of fixed investment is determined by components such as real GDP, the cost of capital, and the potential growth rate. From a theoretical perspective, the divergence from the long-run equilibrium value of fixed investment can be interpreted as being equivalent to stock adjustment pressure, and in the long term, fixed investment can be thought to converge to the long-run equilibrium value and stock adjustment pressure to converge to zero.

Based on this line of reasoning, the short-run dynamics determining developments in fixed investment are a function of the stock adjustment pressure in addition to the rates of change in real exports and industrial production. The estimation results of the short-run dynamics indicate that the parameter on stock adjustment pressure is significantly negative, meaning that the growth rate of fixed investment tends to decrease in periods of strong adjustment pressure (Chart B2-3).

## Chart B2-2: Investment Function

**Long-run equilibrium based on Bean (1981)**

$$ln(I_t) = Const. + \beta \times ln(C_t) + \frac{g_t}{\delta_t} + ln(Y_t)$$

where $I_t$ = Real investment, $Y_t$ = Real GDP
$C_t = \tau_t \times \left(p_t^k / p_t\right) \times \left(i_t + \delta_t - \Delta p_t^k / p_t^k\right)$
$p_t^k$ = Investment deflator, $p_t$ = Domestic demand deflator
$i_t$ = 10-year government bond yields
$\delta_t$ = Trend-cycle component of depreciation rate
$g_t$ = Potential growth rate
$\tau_t$ = Corporate tax adjustment factor

**Short-run dynamics**

$$dln(I_t) = Const. + \theta \times dln(Exports_t) + \sum_{i=1}^{9} \gamma_i \times dln(IIP_{t-i}) + \varphi \times EC\ term_{t-1}$$

where $Exports_t$ = Real exports
$IIP_t$ = Industrial production
$IIP$ is assumed to follow an Almon lag structure.

## Chart B2-3: Estimation Results

**Long-run equilibrium**

| Dependent variable: ln(I) | |
|---|---|
| ln(cost of capital) | -0.193 *** |
| S.E. of regression | 0.030 |
| Estimation period | 1995/Q1-2018/Q3 |

**Short-run dynamics**

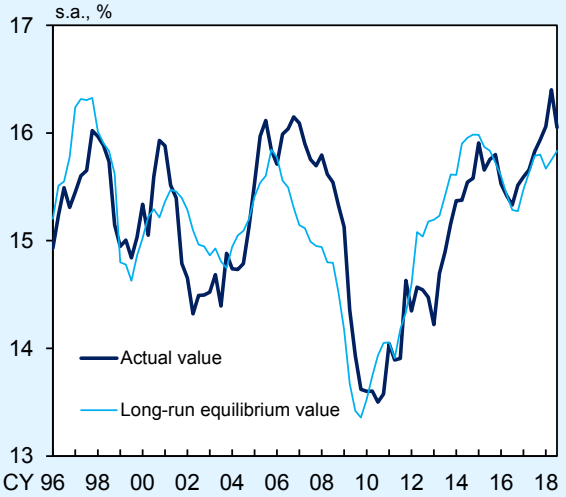
| Dependent variable: dln(I) | |
|---|---|
| Stock adjustment pressure | -0.175 *** |
| dln(real exports) | 0.146 *** |
| dln(IIP) | 0.707 *** |
| S.E. of regression | 0.016 |
| Estimation period | 1996/Q3-2018/Q3 |

Sources: Ministry of Finance; Cabinet Office, etc.
Note: *** denotes statistical significance at the 1% level. dln(IIP) denotes the sum of parameters estimated for lags.

[38] The long-run equilibrium employed here is based on Charles Bean, "An Econometric Model of Manufacturing Investment in the UK," *Economic Journal*, vol. 91 (1981): 106-21.

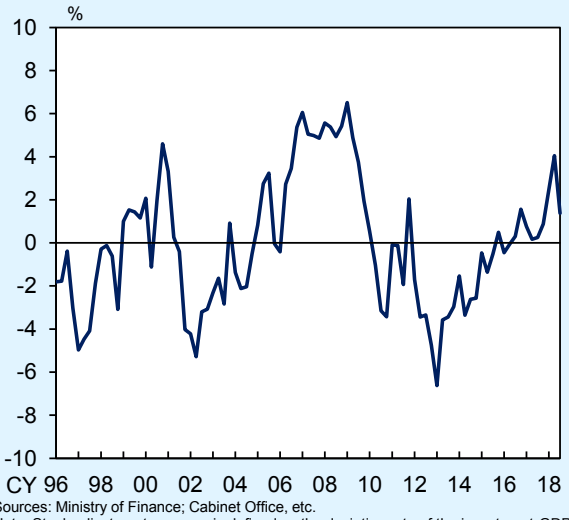
Current fixed investment is above the long-run equilibrium value and has entered a phase in which stock adjustment pressure pushes down fixed investment (Charts B2-4 and B2-5). However, the degree of stock adjustment pressure is fairly small compared to the period around the global financial crisis from around 2006 to 2008, when the potential growth rate dropped sharply. Moreover, the investment function shown here does not sufficiently capture, for example, the fact that firms are actively making labor-saving investment in response to labor shortage. In addition to these points, considering that exports are projected to continue their moderate increasing trend, fixed investment is likely to maintain an increasing trend even if its pace of increase decelerates.

**Chart B2-4:** Investment-GDP Ratio (Real)




Sources: Ministry of Finance; Cabinet Office, etc.

**Chart B2-5:** Stock Adjustment Pressure




Sources: Ministry of Finance; Cabinet Office, etc.
Note: Stock adjustment pressure is defined as the deviation rate of the investment-GDP ratio (real) from the long-run equilibrium value.