
Mizuho Economic Outlook & Analysis

January 5, 2016

Durable goods hamper personal consumption growth

- *A full-scale stock adjustment has been triggered by the front-loading of future demand* -

< Summary >

- ◆ Personal consumption has remained sluggish since the consumption tax hike. In this report, I focused on the consumption of durable goods that is weakening in particular.
- ◆ The stock of durable goods owned by households rose sharply after the financial crisis. Unconventional movements in the stock cycle suggest that front-loading of future demand occurred on the back of successive purchase support measures.
- ◆ Based on past stock cycle patterns, a clear recovery in the growth of durable goods consumption may take another couple of years. Stock adjustment pressures on durable goods are expected to weigh on the recovery of personal consumption for the time being.

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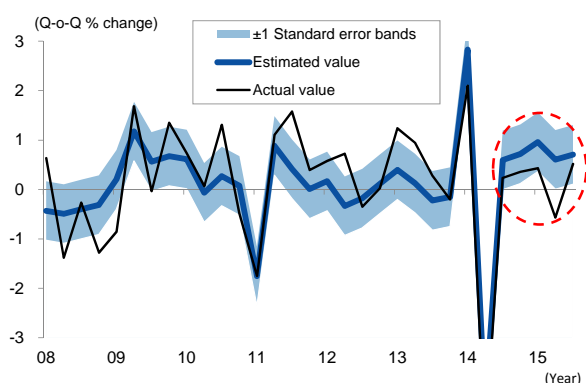
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1. Personal consumption remains sluggish

Despite a gradual improvement of labor market conditions, personal consumption remains sluggish. While consumption grew +0.4% quarter-on-quarter (Q-o-Q) in the Jul-Sep quarter of 2015, it was unable to gain back the earlier Apr-Jun quarter loss (-0.5%) and has remained weak. If we estimate a consumption function that incorporates variables such as real income and real financial assets (**Chart 1**), personal consumption continued to fall short of the estimated value. This suggests the presence of structural downward pressures, in addition to one-time factors that have been often pointed out, such as the weather.

Chart 2 shows the trends in personal consumption from the 3rd quarter of 2013 prior to the last-minute demand ahead of the consumption tax hike. While consumption of services (accounting for about half of total consumption) remained virtually unchanged, consumption of goods fell from the level registered before the tax hike. Spending on durable goods is particularly weak at about 90% of the previous level, dragging down overall consumption. Although the share of durable goods is barely 10% (in nominal terms), its impact on the overall level of consumption is significant due in part to its high fluctuation. In this report, I seek to unveil the factors that explain the ongoing weakness of personal consumption by focusing on durable goods.

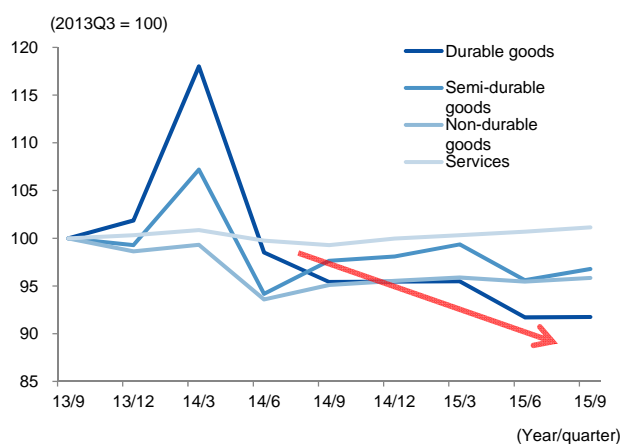
Chart 1: Consumption function based on an error correction model



Note: Our estimation is based on an error correction model assuming a long-term equilibrium relationship between personal consumption, real income, and real financial assets. In addition to these variables, the short-run estimate also incorporates last-minute purchases before the consumption tax hike and the impact of the Great East Japan Earthquake. Refer to Supplementary Discussion 1 for the estimation results.

Source: Estimated by MHRI based on the Cabinet Office and the Bank of Japan, among others.

Chart 2: Real consumption based on goods and services



Source: The Cabinet Office, *National Accounts*.

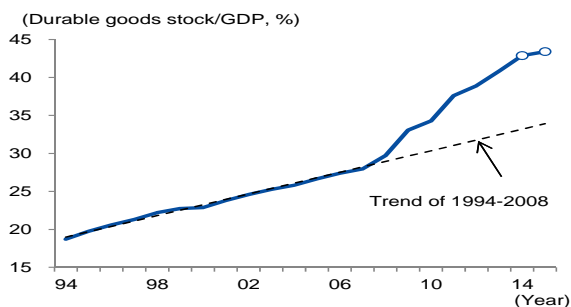
2. Stock cycle chart suggests a front-loading of future demand

(1) Stock of durable goods rose sharply after the financial crisis

Consumers purchase durable goods for long-term use over several years, resulting in a lower purchase frequency compared to such items as foodstuffs and non-durable goods (while semi-durable goods such as clothes share similar characteristics, their useful life is shorter than durable goods). For example, according to the *Consumer Confidence Survey* compiled by the Cabinet Office, the average useful life of refrigerators and air conditioners is approximately 10 years, and around seven to eight years for televisions and automobiles. In the case where a great number of households recently purchased a new car, a significant increase in new car demand cannot be expected for several years. Thus when making projections on durable goods consumption, it is necessary to take into account the volume of existing stock currently possessed by households.

According to the *National Accounts*, the stock of durable goods at the end of 2013 stood at 215 trillion yen (based on 2005 prices) in real terms, accounting for over 40% of Japan's real GDP.¹ Estimations based on the current actual flow figures (i.e. consumption of durable goods) show that the level of stock in 2014 and 2015 appears to have risen further (**Chart 3**). Although the increase in stock was somewhat in line with the overall trend until 2008, note a significant uptick of the pace of growth from 2009 onward. Looking at the details, growth in information and communication equipment (televisions, personal computers, mobile phones, etc.) accelerated since the economic slump following the collapse of Lehman Brothers (the "Lehman Shock") (**Chart 4**).

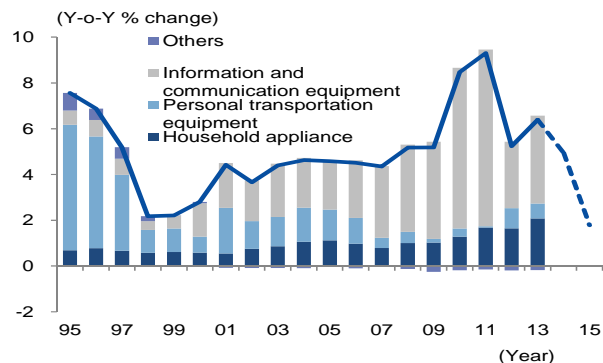
Chart 3: Stock of durable goods to GDP



Note: Stocks of durable goods in real terms in 2014 and 2015 were calculated based on the actual value of durable goods consumption (seasonally-adjusted value from January to September for 2015) and the extrapolated depreciation rate in accordance with the trend.

Source: Made by MHRI based on the Cabinet Office, *National Accounts*.

Chart 4: Breakdown of durable goods stock (in real terms)



Note: Same as Chart 3

Source: Made by MHRI based on the Cabinet Office, *National Accounts*.

The major reason for the considerable growth of households' durable goods was the government's introduction of various purchase incentives targeting certain items. The "Policy Package to Address the Economic Crisis" (April 2009), implemented immediately after the Lehman Shock, included a subsidy for purchases of environmentally-friendly cars (budget size: approx. 350 billion yen) and a program using eco-points to promote the spread of energy-saving and environmentally-friendly ("green") home appliances (budget size: approx. 300 billion yen).² Such measures may be commended to have generated certain positive effects, stimulating demand that had been restrained due to growing concerns over the economic outlook and avoiding a further decline in business conditions. Nonetheless, the two measures were either extended or revived, even after Japan's economy had overcome the financial crisis, and the overall size of the final support measures reached 1.5 trillion yen. It is highly likely that the enhancement of purchase incentive measures not only revealed subdued demand but also led to the front-loading of future demand. In addition, the transition to digital terrestrial transmission (July 2011) and the increase in the consumption tax rate (April 2014) also should have spurred the front-loading of future demand.

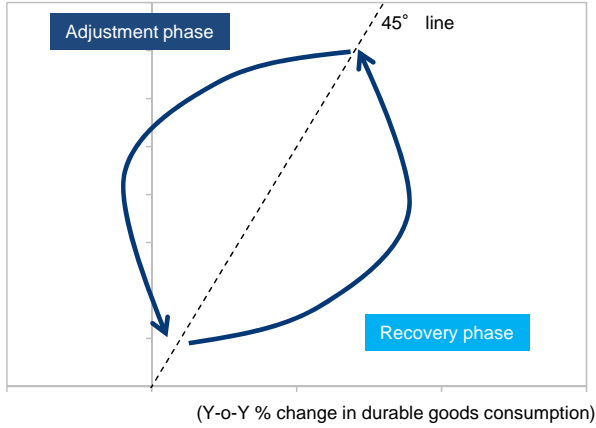
(2) Stock cycle chart shows unconventional movements

The front-loading of future demand can also be seen from the movement of the stock cycle. If we plot the growth of durable goods consumption on the horizontal axis and growth in durable goods stock on the vertical axis, we would usually expect to see a counter-clockwise cycle (see the conceptual diagram in **Chart 5**). At the outset of the cycle, the depletion of existing goods (decline in stock) prompts the repurchase of goods and pushes up consumption at a pace faster than the growth in stock (right hand side of the 45° line); but once repurchases are completed and the need to accumulate stock is depleted, consumption growth slows down and the cycle enters an adjustment phase (left hand side of the 45° line). Later on, as the need for repurchases arises once again, the cycle reenters the recovery phase and the movement continues to recur.

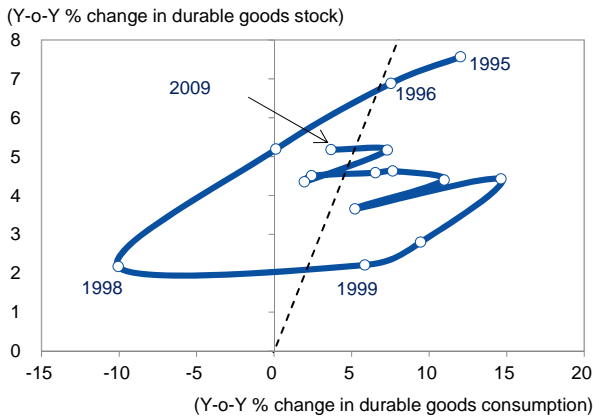
Data confirms the existence of a counter-clockwise cycle in the past (**Chart 5**). From the 1980s to the mid-1990s ([1]), and before the Lehman Shock ([2]), it took roughly 14 years to complete one cycle. Looking at the recent trend ([3]), up until 2009 the cycle followed the usual trend seen after the mid-1990s, and we would have expected the cycle to enter the adjustment phase shortly. However, contrary to conventional patterns, both consumption and stock grew sharply after 2010.

Chart 5: Stock cycle of durable goods
Conceptual diagram [1] 1981 - 1995

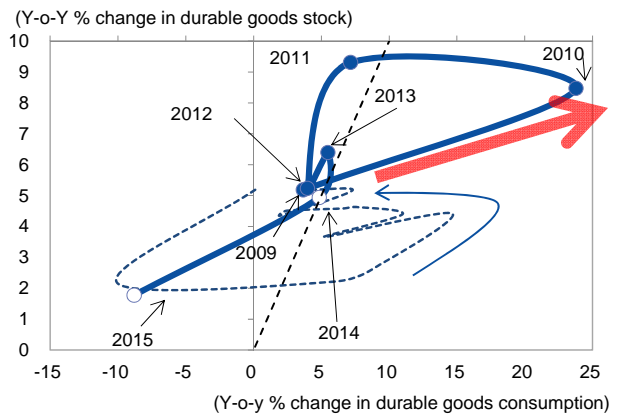
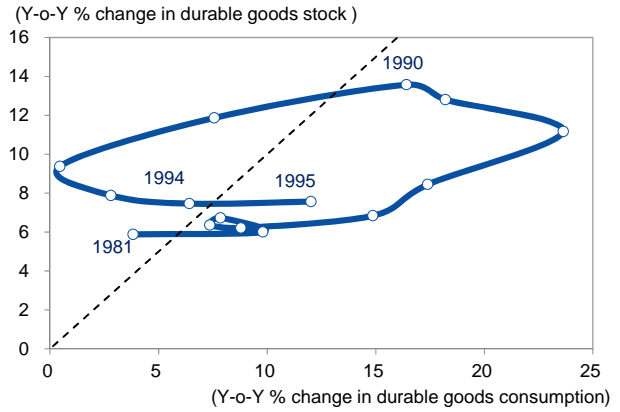
(Y-o-Y % change in durable goods stock)



[2] 1995 - 2009



[3] 2009 -



Note: Same as Chart 3. The diagonal line represents the 45° line.
 Source: Made by MHRI based on the Cabinet Office, *National Accounts*.

Chart 4 reveals significant growth in IT equipment stock, and the upper shift in the cycle may be explained by the increase in demand for evermore popular smartphones. But if we look back at the case of personal computers, the presence of which also rapidly spread, no unusual movements were observed in the cycle between the late 1990s to the early 2000s. In addition, since some portion of smartphone sales must be replacing existing mobile phones, not all smartphone purchases lead to a direct and immediate expansion of stock. With the sudden fluctuation after 2010 being so significant that it cannot be explained solely by the natural profusion of new products (along with income, etc.), we should consider that the movement was caused by the sharp increase in the purchase of flat panel TVs prompted by the eco-point system and the transition to digital

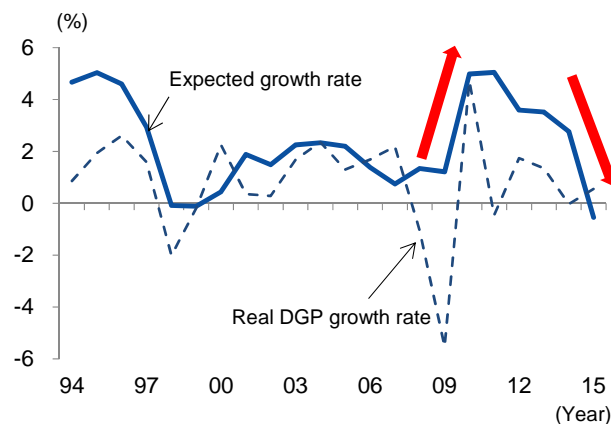
terrestrial transmission. It should be noted that growth in transportation equipment stock heightened after 2012. From this we can infer that front-loading of automobile demand did not occur with the first round of the eco-car subsidy program (April 2009 to September 2010) but with the revival of the subsidy (December 2011 to September 2012)³.

Thus the stock cycle suggests that there was considerable front-loading of consumption of durable goods after the financial crisis. Currently, now that the impact of various stimulus programs has dissipated, it seems that the time for a full-fledged stock adjustment has arrived, just like in 1998 in the cycle (2).

(3) Expected growth rate suggested by the stock cycle declined sharply after marking rapid growth

Since durable goods are intended for use over several years, the movement of such goods is considered to reflect households' expectations for the future, a case similar to firms' capital investment. In other words, when the consumption of durable goods is expanding rapidly (or slowly), such goods are usually presumed to reflect the households' heightening (or lowering) expectations for the future. **Chart 6** shows the expected growth rate of households suggested by the stock cycle under certain assumptions. While we need to be aware that the outcome is subject to substantial change depending on assumptions such as the depreciation rate, it does suggest that the expected growth rate rose to a level unseen in the recent past from 2010 to 2013. On the other hand, with the exception of 2010, when the figure rallied sharply, the actual growth rate did not grow exceedingly during these years. Thereafter, the expected growth rate began to decline and

Chart 6: Expected growth rate suggested by the stock cycle



Note: The results may change significantly depending on the assumptions, thus we need to be aware that the results may vary within a certain range. Refer to Supplementary discussion 2 for the estimation method.
 Source: Made by MHRI based on the Cabinet Office, *National Accounts*.

is now hovering at a level lower than the figure registered before the Lehman Shock. From the unconventional hike in the expected growth rate, which deviates from the actual economic conditions, and its decline thereafter, we can perceive the impact of various purchase support programs.

3. Stock adjustment pressure is expected to remain for a while

On the back of the moderate recovery of income, the general view is that personal consumption will recover gradually. Nonetheless, if we focus on the development of stock explained in the previous section, there is a strong possibility that this view will not materialize, at least for the consumption of durable goods.

If we look at the two stock cycles in the past depicted in **Chart 5**, the adjustment phase lasted about three to four years (from 1990 to 1994 and from 1996 to 1999). Given that two years have passed since the cycle entered the adjustment phase in 2013, the same empirical rule suggests that it should take another one to two years until the cycle shifts to a clear recovery phase. Stock adjustment pressure on durable goods will likely continue to hamper the recovery of personal consumption for the time being.

Supplementary discussion 1: Consumption function based on an error correction model

Long-term equilibrium formula

$$\begin{aligned} \log(\text{real consumption}) &= 2.695^{***} + 0.374^{***} \times \log(\text{real disposable income}) + 0.345^{***} \\ &\quad \times \log(\text{real financial assets}) \end{aligned}$$

Error correction model

$$\begin{aligned} \text{dlog}(\text{real consumption}) &= 0.002^{**} + 0.201^* \times \text{dlog}(\text{real disposable income}) + 0.115^{**} \\ &\quad \times \text{dlog}(\text{real financial assets}) \\ &\quad - 0.347^{***}(\text{error correction term}_{-1}) + 0.032^{***} \times (\text{last minute purchases dummy}) \\ &\quad - 0.019^{***} \times (\text{Earthquake dummy}) \end{aligned}$$

Estimate period: 1998Q1- 2015Q3.

adj.R²=0.614, D.W. =1.737

***, **, * indicates significance at the 1%, 5%, 10% level, respectively

- * Last minute purchases prior to the consumption tax hike dummy: 2014Q1 = 1, 2014Q2 = -1. The Great East Japan Earthquake dummy: 2011Q1 = 1.
- * Disposable incomes for 2015Q2/Q3 are calculated using the disposable income of worker households in the Family Income and Expenditure Survey and the seasonal dummy, and are adjusted seasonally after being deflated by the consumption deflator.
- * Outstanding financial assets are also deflated by the consumption deflator.

The error correction term represents the mechanism of trying to return to the long-term equilibrium. It becomes negative when it exceeds the long-term equilibrium and positive when lower.

Supplementary discussion 2: Method to estimate the expected growth rate

Let D_t denote durable goods stock, C_t durable goods consumption, and Y_t real GDP. Then, from $D_t = Y_t \times D_t/Y_t$,

$$\frac{\Delta D_t}{D_{t-1}} = \frac{\Delta Y_t}{Y_{t-1}} + \frac{\Delta(D_t/Y_t)}{D_{t-1}/Y_{t-1}} \equiv g_t + \gamma_t$$

g_t represents GDP growth rate, and γ_t growth of the capital coefficient (stock/GDP). On the other hand, if we denote δ_t as the depreciation rate, from $\Delta D_t = C_t - \delta_t D_{t-1}$,

$$\frac{\Delta D_t}{D_{t-1}} = \frac{C_t}{D_{t-1}} - \delta_t$$

If we combine the two formulas, we can confirm a relationship between the change rates of durable goods consumption, depreciation rate, growth rate and capital coefficient, as shown in the following formula:

$$\frac{C_t}{D_{t-1}} = \delta_t + g_t + \gamma_t$$

Here, if we consider that households purchase durable goods to achieve the ideal level of stock given a certain depreciation rate δ and the change rate of capital coefficient γ , we can calculate the expected growth rate g_t^e of households that matches the durable goods consumption using the above formula. For the depreciation rate in **Chart 6**, I used the average over the past five years since it shows a gradual upward trend, and for the capital coefficient I used the average growth rate between 1994 and 2008 when the figure was developing along a stable trend (see **Chart 3**).

Notes

- 1 It should be noted that the stock of durable goods remained at roughly 136 trillion yen (slightly smaller than 30% of GDP) in nominal terms. This is primarily due to the acceleration in the declining trend of durable goods prices, mainly of information and communication equipment, along with the improvement of product quality.
- 2 The transition of the subsidy for purchases of environmentally-friendly cars and eco-points for green home appliances is as follows.

	Subsidy for purchases of environmentally-friendly cars	Eco-points for green home appliances
First supplementary budget for FY2009 [Policy Package to Address the Economic Crisis (Apr. 2009)]	354.9 billion yen (Apr. 2009 – Mar. 2010)	294.6 billion yen (May 2009 – Mar. 2010)
Second supplementary budget for FY2009 [Emergency Economic Countermeasures for Future Growth and Security (Dec. 2009)]	228.6 billion yen (– Sep. 2010)	232.1 billion yen (– Dec. 2010)
Contingency Reserve for Economic Crisis Response and Regional Revitalization for FY2010	—	88.5 billion yen
Supplementary budget for FY2010 [Comprehensive Emergency Economic Measures in Response to the Yen's Appreciation and Deflation (Sep. 2010)]	—	77.7 billion yen (– Mar. 2011)
Fourth supplementary budget for FY2011 (Dec. 2011)	274.7 billion yen (Dec. 2011 – Sep. 2012)	—
Total	858.2 billion yen	622.9 billion yen

Note: The subsidy for purchases of environmentally-friendly cars excludes administration costs. (Size of the supplementary budget for FY2011 is for private cars.)

Source: Made by MHRI based on the Ministry of Economy, Trade and Industry and the Ministry of the Environment, among others.

- 3 Our view that the effect of the first subsidy program for environmentally-friendly car purchases was the actualization of restrained demand is consistent with the following report.
- Kaori Yamato (2011). “Perspective when considering the effect of the revival of the subsidy for environmentally-friendly car purchases,” “Mizuho Insight,” (in Japanese only) the Mizuho Research Institute (December 27).