Article

The Impact of Quantitative Easing on Consumption Inequality in Japan

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Abstract

This paper measures the impact of unconventional monetary policy on consumption inequality in Japan using data from the Family Income and Expenditure Survey. The literature mostly focuses on the effects of quantitative easing on income inequality due to data constraints, but we argue that focusing on income inequality alone is likely to be misleading. We find that the impact of quantitative easing on consumption inequality in Japan is much smaller than its impact on income inequality as reported in the literature. This is likely because the impact of quantitative easing on incomes were temporary (permanent incomes did not change much), so this effect did not translate into similar changes in consumption. Another possible explanation is, because the households at the bottom of the income distribution have higher propensities to consume, they might have spent higher shares of their income gains compared to the households at the top, so consumption inequality did not rise as much as income inequality.

Keywords: distribution, inequality, monetary policy
JEL Classification: D31, E52, E58

Ⅰ. Introduction

After the 2008 financial crisis, the central banks of the developed countries extensively used unconventional monetary policy tools such as quantitative easing. They did this because they faced near-zero interest rates and so were unable to further lower the interest rates to stimulate their economies. The large-scale asset purchase programs under quantitative easing policies have increased asset prices substantially. And because these assets

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are mostly held by the wealthy, these policies have led to an extensive discussion on the distributional effects of quantitative easing policies. Normally, the central banks are mostly concerned about keeping the prices stable and unemployment low. However, the effects of the recent unconventional monetary policies implemented by central banks gave rise to the argument that central banks should also consider the distributional effects of their policies.

This paper examines the effects of quantitative easing on inequality, specifically consumption inequality in Japan after the 2008 financial crisis. Why should we focus on consumption inequality? The related literature mostly focuses on the effects of quantitative easing on income inequality. This is mainly because data for income inequality is widely available. However, income data might paint a distorted picture about the distributional effects of quantitative easing for the following reasons: First, income data alone might exaggerate the distributional effects of quantitative easing. For example, to the degree that asset holders have sold their assets at increased prices caused by quantitative easing, their incomes would have increased for a few periods. And because income data offers a snapshot of current incomes, we observe relatively large increases in income inequality. Consumption inequality, on the other hand, would likely not change as much, because people would probably base their consumption decisions on their 'permanent incomes', not on temporary rises in their incomes.[1] Second, income inequality might understate the distributional effects of quantitative easing. An individual whose assets have gained tremendous value, might increase his consumption without actually selling any of his assets, knowing that he can afford it, that his 'permanent income' is much higher than before.[2] Income inequality would not capture this, while consumption inequality would. Here, we should note that wealth inequality would also capture this effect, but the availability of high-frequency wealth data is very limited. For these reasons, focusing on consumption inequality would give us another perspective and might help us in better understanding the distributional effects of quantitative easing.[3]

We investigate the effects of quantitative easing on consumption inequality in Japan to see whether focusing on consumption inequality rather than income inequality gives us additional insights on the distributional effects of quantitative easing. This paper is organized as follows: Section II gives a brief literature review, Section III explains the data and discusses potential issues, and Section IV explains the empirical model and discusses the results of the estimations. Lastly, Section V concludes this paper.

Ⅱ. Literature Survey

There are not many studies that focus on the distributional effects of monetary policy before the 2008 financial crisis. Romer and Romer (1999) find that expansionary monetary

policy creates improved conditions for the poor in the short run, but they argue that low inflation and stable aggregate demand is better for the poor in the long run. Similarly, Albanesi (2007) find that inflation created by expansionary monetary policy increases income inequality.

After the 2008 financial crisis, the quantitative easing policies implemented by the central banks of the developed countries caused much academic interest and resulted in many studies relating to distributional effects of monetary policy. Notably, Coibion et al. (2017) find for the US that contractionary monetary policy increases income inequality. They use the 'Consumer Expenditure Survey' to calculate Gini coefficients and note that the survey has a limitation on including the top 1% of the income earners in the sample. Davtyan (2017), argues that the top 1% makes all the difference and find that contractionary monetary policy decreases income inequality instead of increasing it. However, she uses OECD data for Gini coefficients, which is constructed by using the 'Current Population Survey' for the US., and it likely suffers from the same issues that other surveys suffer such as under-representation of top income earners and under-reporting of incomes and spending. Therefore, the difference between the two studies might not be due to the inclusion of top 1%, but due to their sample periods, Coibion et al. (2017) end their sample in 2008, while Davtyan (2017) ends her sample in 2012 and was able to capture some of the effects of quantitative easing. Overall, the literature[4)] finds mixed results and the distributional effects of monetary policy are mostly modest in both directions.

For Japan, Saiki and Frost (2014, 2018), Israel and Latsos (2020), Feldkircher and Kakamu (2021), and Yuksel (2021) find that expansionary monetary policy increases income inequality and contractionary monetary policy decreases it. Inui et al. (2017) find that conventional expansionary monetary policy up to 1998 increases inequality, however, when they extend the sample period to 2008 to include the effects of unconventional monetary policy, this effect becomes insignificant.

Concerning consumption inequality, Coibion et al. (2017) find that contractionary monetary policy increased consumption inequality in the US. Mumtaz and Theophilopoulou (2017), and Georgarakos and Tatsiramos (2019) find the same results for the UK. Similarly, Ampudia et al. (2018), find that contractionary monetary policy increased consumption inequality in Europe. This is because, after a rise in interest rates caused by contractionary monetary policy, low-income households who do not have access to liquidity reduce their consumption while other households do not change their consumption. Lastly, Inui et al. (2017) find for Japan that expansionary monetary policy has slightly increased income inequality, but this increase has not translated into consumption inequality. However, they found this for their sample that ends in 2008. Considering the amount of asset purchases after 2008 (second phase of quantitative easing) is dramatically higher compared to the first phase of quantitative easing (2001–2006) in Japan, this result might change with the

addition of newer data.

Ⅲ. Data

We use data from the Family Income and Expenditure Survey of the Statistics Bureau of Japan, which is a nationally representative dataset collected by a three-stage stratified sampling method. This is a micro dataset, but only semi-aggregated data is available publicly. However, because the surveyed households are replaced regularly, the advantages of using micro data are limited in this case. We use the 'Income and Expenditure' subset of the Family Income and Expenditure Survey to calculate consumption inequalities

Family Income and Expenditure Survey covers all of Japan. Data for around 8,000 households (of two or more persons) are collected monthly for six consecutive months, and then these households are replaced. Survey participants are requested to record their expenditures daily.

Although we have access to monthly data, we decided to use quarterly data because of two reasons. First, it is not plausible to expect that monthly changes in macroeconomic variables would affect household consumption dramatically. Second, consumption data shows large variances from month to month, making it difficult to measure the effects on consumption of other variables in the model. Using quarterly data somewhat smooths out this variance.

We created three consumption variables: durable consumption, non-durable consumption, and total consumption. Although there are different views on how to separate 'durable' and 'non-durable' consumption[5], we followed the categorization[6] preferred by Lise et al. (2014), which is also followed by Inui et al. (2017), to make it easier to compare results. However, there are some differences in samples between this study and Inui et al. (2017). First, they use micro data, while we use semi-aggregate data, but as discussed earlier, because the households are replaced every 6 months, the benefits of using micro data are not fully realized. Second, they use consumption data up to 2008 (after which micro-data is not available), while we use data up to 2019, and because the second phase of quantitative easing starts after 2008 in Japan (and the scale dramatically increases after 2013), this study should better capture the impact of quantitative easing on consumption inequality. Third, they limit their sample to people aged between 25–59, while semi-aggregate data we use do not have that restriction. Lastly, they limit their sample to worker households only, while our sample covers both working and non-working households. Considering the unemployed households are a big part of the discussion concerning inequality, including them in the sample should help us see the bigger picture.

There are other surveys that contain consumption information in Japan. Namely, National

Survey of Family Income and Expenditure (NSFIE-every 5 years), Survey of Household Economy (SHE-monthly), Comprehensive Survey of Living Conditions (CSLC-every 3 years), and Japan (and Keio) Household Panel Survey (JHPS and KHPS-yearly). Unayama (2015) shows that consumption data collected by the Family Income and Expenditure Survey (FIES) is lower compared to SHE (approximately 80% of the consumption level in SHE). Unayama suggests that there might be two reasons for this. First, the households in the FIES are asked to record their expenditures daily-which is difficult, compared to a single time in the SHE. This probably results in people forgetting to record some expenditures in the FIES. Second, the households in the FIES might under-report because of survey fatigue. Stephens and Unayama (2011, 2012) indeed find that average reported consumption in FIES decreases towards the end of the six-month survey period for each household (Higa, 2019). This under-reporting will not create an issue for our purposes if it occurs at the same rate for all income deciles, because we are not interested in levels, but in ratios. Aguiar and Bils (2015) find for the US, that the rich are more likely to under-report their consumption. To the degree that this is true for Japan,[7] our consumption inequality variables would under-measure the inequality. Lastly, Unayama (2015), again, show that the consumption data collected by the FIES is similar to those collected by the NSFIE and CLSC. Unfortunately, none of these surveys have publicly accessible data at quarterly frequency for comparison.

Ⅳ. Empirical Analysis

We use the following VAR model[8] to see the impact of quantitative easing on consumption inequality:

$$Y_t = [GDP_t, Inf_t, MB_t, S_t, Ineq_t]$$

where

GDP_t = Real GDP in yen, seasonally adjusted (source: Japanese Cabinet Office)
Inf_t = Year-over-year CPI headline inflation (source: Statistics Bureau of Japan)
MB_t = Monetary Base, seasonally adjusted and divided by nominal GDP (source: Bank of Japan)
S_t = Nikkei 225 Index, close prices (source: Yahoo Finance)
$Ineq_t$ = The ratio of the consumption of the top 10% of the population to the bottom 10% (source: Author's calculation using 'Income and Expenditure' survey)

We take the first differences of all the variables just listed: natural logs of GDP, quantitative easing proxy (MB), and stock prices(S). We also take the first difference of YOY

inflation. After these transformations, all variables are stationary at the 5% level of significance. The sample period is from 2007Q4 to 2018Q4. We end our sample period just before 2019 so as not to capture the effects of the coronavirus on consumption. The Akaike information criterion suggests 4 lags, while the Hannan-Quinn and Schwarz information criteria suggest 0 lag-which does not seem right. We at first decided to use 4 lags following Akaike because this is quarterly data. However, we need to check the stability of the VAR system before proceeding with further analysis. We also need to confirm that there is no autocorrelation at our selected lag length. The AR roots table shows that the VAR system is not stable at 4 lags, which means that the impulse response standard errors would not be valid. Using 5 lags creates the same issue. When we use 3 lags, the VAR system becomes stable. We then confirm that there is no autocorrelation.[9] Therefore, we use 3 lags in the estimations. Lastly, following Saiki and Frost (2018), we use three exogenous dummy variables to capture (1)the effects of 'the Great Earthquake' of 2011 and (2)the following income transfer responses, because these had an important impact on inequality, as well as (3)the effects of the consumption tax increase. 'eq' takes the value of 1 in 2011Q2 and 2011Q3 to capture the impact of the earthquake, 'eqres' takes the value of 1 in 2011Q4 and 2012Q1 to capture the income transfer responses, and 'tax' takes the value of 1 between 2014Q2 to 2015Q2, all three variables are 0 otherwise. We also impose the recursiveness assumption so that the variables we use are not contemporaneously affected by the variables that come after them in the VAR framework.

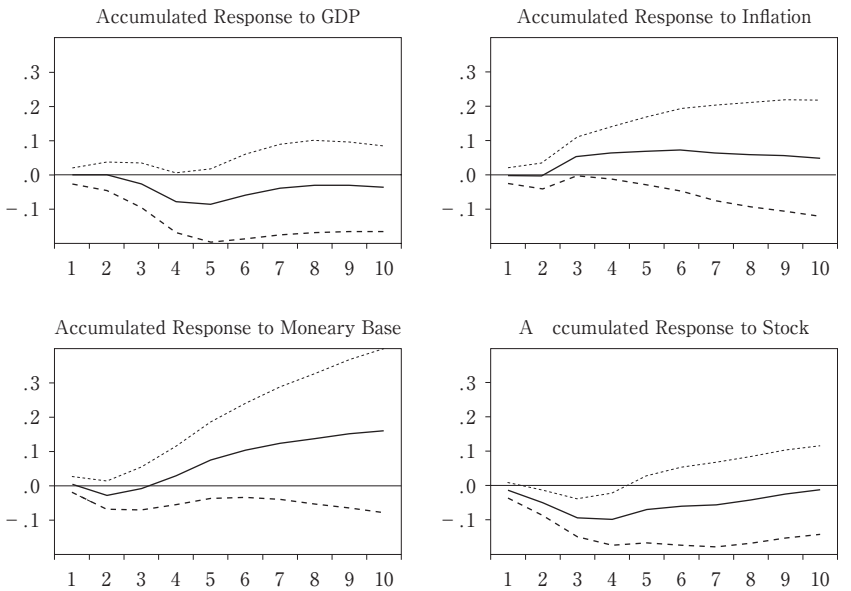
There are various proxies used in the literature to capture the distributional effects of unconventional monetary policy. Mumtaz and Theophilopolou (2017) use the 10-year government bond spread; Unui et al. (2017) use a shadow rate and central bank assets; Saiki and Frost (2014) and Guerello (2018) use central bank assets; while Saiki and Frost (2014, 2018) use the monetary base. It is worth noting that Saiki and Frost (2014) find that monetary base and central bank assets yield very similar results as proxies for unconventional monetary policy, while Inui et al. (2017) find that a shadow rate and central bank assets also yield very similar results. Therefore, all of these measures seem to capture the same effects and be equally good proxies for unconventional monetary policy.

Lastly, adding inflation to our model allows us to test for the impact of quantitative easing on inequality through the 'savings redistribution channel' discussed in Coibion et al. (2017), while adding stock prices allows us to test the impact of quantitative easing through the 'portfolio channel'.

Estimation Results

Figure 1 shows that quantitative easing has increased total consumption inequality by 0.1 percentage points, but this effect lies on the border of statistical significance. The effects of GDP, inflation, and stock prices have a higher significance. A one-standard-deviation up-

Fig 1. Impulse Responses of Total Consumption Inequality (ratio of top10% to bottom 10%), Cholesky d.o.f. adjusted, two standard deviation confidence intervals

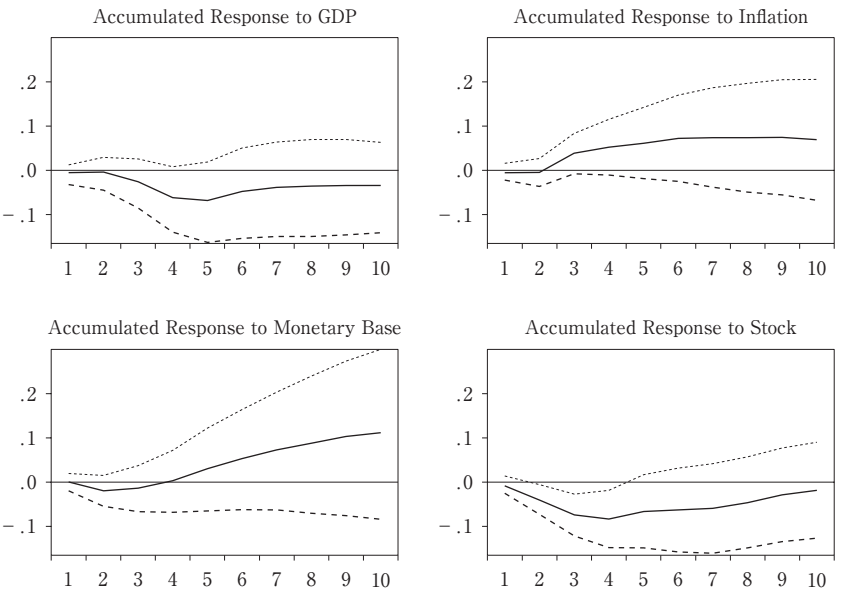


ward shock to GDP reduces total consumption inequality by around 0.05 percentage points, while a one-standard-deviation upward shock to inflation increases total consumption inequality by the same amount. Lastly, a one-standard-deviation upward shock to stock prices reduces total consumption inequality by around 0.1 percentage points. These results do not support the argument that quantitative easing would overall reduce inequality by stimulating economic activity. Even though a rise in GDP helps reduce consumption inequality and quantitative easing has a positive effect on GDP through the stock market[10] (it does not have a direct effect on GDP), the overall effect of quantitative easing on consumption inequality is to increase it.

Our results have other implications. Appendix 5 shows that one of the ways that quantitative easing has increased consumption inequality is through inflation. Quantitative easing had a positive effect on inflation and inflation in turn had a positive effect on consumption inequality. Higher inflation unproportionally hurts the poor who hold a higher share of their wealth as cash (Erosa and Ventura 2002, Albanesi 2007) which increases inequality (portfolio channel); but it transfers wealth from savers (usually the rich) to borrowers (usually the poor) which decreases inequality (savings redistribution channel). Our results suggest that the portfolio channel dominates the savings redistribution channel and the overall effect of inflation on consumption inequality is positive in Japan.

Overall, our results suggest that quantitative easing has increased consumption inequality through inflation but reduced it through GDP and stock market. However, the effect through inflation dominates and the sum of these effects are small but positive-taken over-

Fig 2. Impulse Responses of Non-Durable Consumption Inequality (ratio of top10% to bottom10%), Cholesky d.o.f. adjusted, two standard deviation confidence intervals

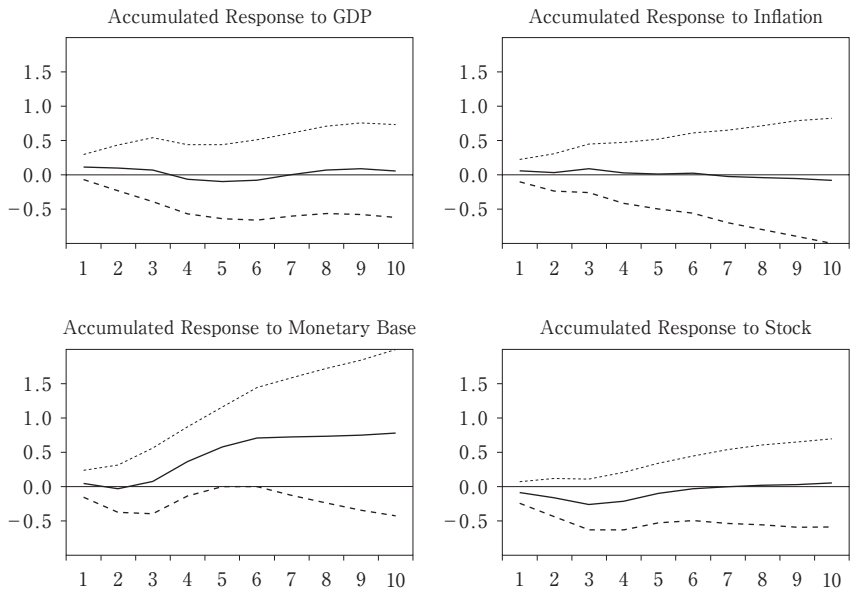


all, they increase consumption inequality slightly. This supports the finding of Inui et al. (2017) that quantitative easing did not have a large effect on consumption inequality in Japan up to 2008, and this relation holds when we extend the sample period up to 2019.

Figure 2 shows the impulse responses of non-durable consumption inequality. The results are almost identical to total consumption inequality in figure 1, although the effect of quantitative easing loses some of its significance.

Figure 3 shows the impulse responses of durable consumption inequality. GDP and inflation do not have a statistically significant effect on durable consumption inequality in Japan. A one-standard-deviation upward shock to the monetary base increases durable consumption inequality by around 0.5 percentage points, while a one-standard-deviation upward shock to stock prices reduces it by around 0.3 percentage points. Overall, it seems that quantitative easing has increased durable consumption inequality by more than it has increased non-durable consumption inequality (0.5 percentage points as opposed to 0.1 percentage points). This is not surprising, because non-durable consumption is generally less elastic to income changes, while durable consumption is more elastic. People might delay purchase of a durable good (such as a car) in the case of a negative income shock, while they are less likely to reduce their non-durable consumption (such as food).

Fig 3. Impulse Responses of Durable Consumption Inequality (ratio of top10% to bottom10%), Cholesky d.o.f. adjusted, two standard deviation confidence intervals



Robustness Checks

Different inequality measure

The inequality measure used could affect our results. To investigate this possibility, we change the consumption inequality measures from 'the ratio of top 10% to bottom 10%' to 'Gini coefficient'. Figures 4, 5, and 6 show the impulse response functions for total consumption, non-durable consumption, and durable consumption inequalities using Gini coefficients. The results show that even though the directions of the effects are the same, the estimated magnitudes of the effects are much smaller when using Gini coefficients. This suggests, as argued by Saiki and Frost (2014), that quantitative easing has affected the gap between the top and the bottom of the population more than it has affected the whole distribution (which Gini measures).

Saiki and Frost (2018) find that a one-standard-deviation upward shock to the monetary base has increased income inequality (measured by Gini coefficient) by around 1.1 percentage points in Japan. We find that the same shock to monetary base has increased the total consumption inequality by 0.1 percentage points (ratio of top 10% to bottom 10%) and by 0.005 percentage points (Gini coefficient). This comparison shows that quantitative easing has affected income inequality much more than consumption inequality in Japan. One potential explanation for this is the effects of quantitative easing on income inequality were temporary and people did not change their consumption decisions much because their 'permanent incomes' did not change much. Mumtaz and Theophilopoulou (2017) com-

Fig 4. Impulse Responses of Total Consumption Inequality (Gini coefficient), Cholesky d.o.f. adjusted, two standard deviation confidence intervals

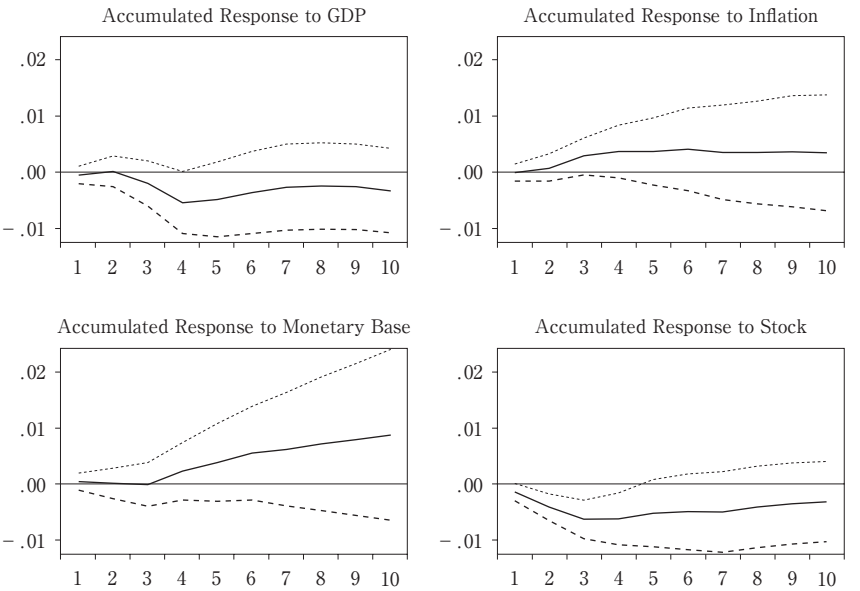
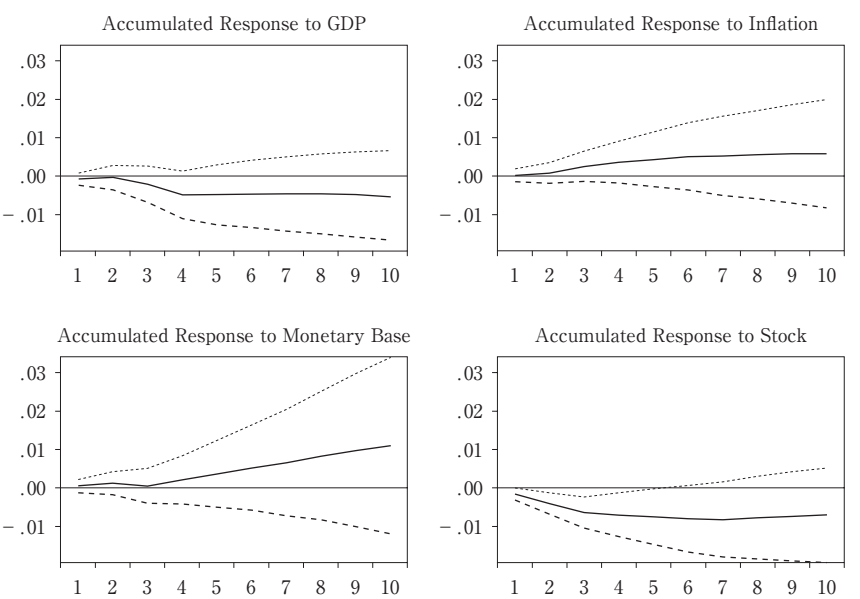
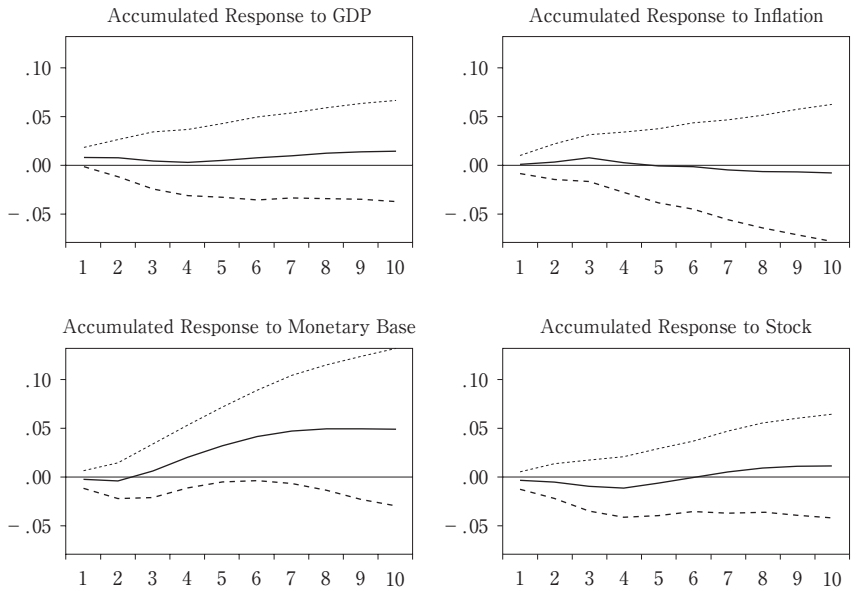


Fig 5. Impulse Responses of Non-Durable Consumption Inequality (Gini coefficient), Cholesky d.o.f. adjusted, two standard deviation confidence intervals



pare the effects of quantitative easing to a counterfactual of 'no policy' in the UK and find that quantitative easing had a larger impact on income inequality compared to consumption inequality in the UK too. However, Coibion et al. (2017) find for the US that contractionary standard monetary policy had a larger impact on consumption inequality (0.02

Fig 6. Impulse Responses of Durable Consumption Inequality (Gini coefficient), Cholesky d.o.f. adjusted, two standard deviation confidence intervals

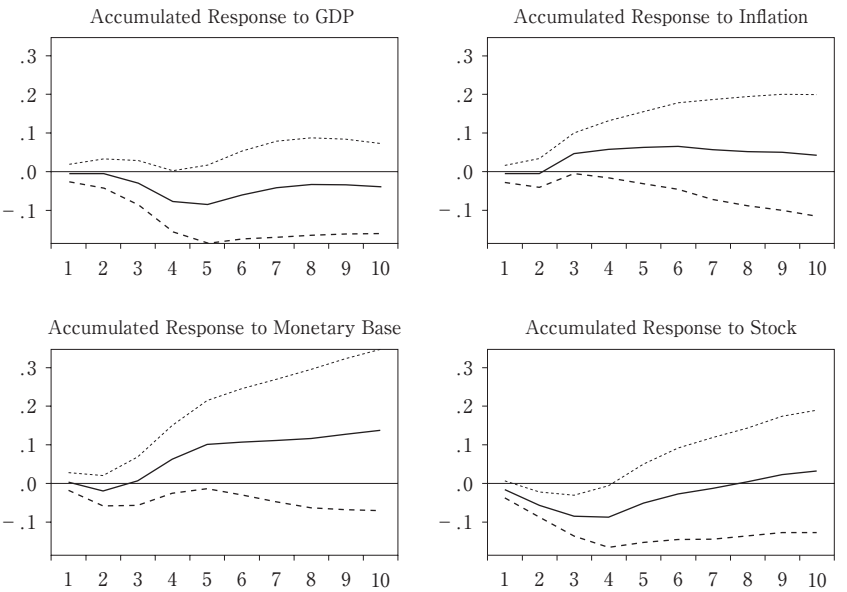


percentage point rise) compared to income inequality (0.01 percentage point rise). They find that this is mostly driven by the disproportional rise in the consumption of the top 90th percentile compared to the rise in their incomes (their consumption rose by around 10 % compared to 2–3% rise in their incomes, while the consumption and incomes of the bottom 10th percentile dropped by around 2%). Lastly, Inui et al. (2017) offer another explanation and find for Japan that marginal propensity to consume is higher for the households at the bottom of the income distribution compared to the households at the top. They argue that the rich spent relatively lower share of the income they gained through quantitative easing, but the poor spent a higher share of their income gains. Therefore, this is likely one of the reasons why consumption inequality did not rise as much as income inequality in Japan.

Different estimation method

The method of calculating the impulse response functions could also affect our results. For this reason, we change the estimation method from Cholesky decomposition to generalized impulse responses. The ordering of the variables is important when using the Cholesky decomposition method because of the recursiveness assumption that we impose, but the ordering does not matter when using the generalized impulse responses method.[11] Figure 7 shows that the results are almost identical to the results obtained by the Cholesky decomposition (figure 1). This provides evidence that our results are robust to estimation method.

Fig 7. Impulse Responses of Total Consumption Inequality (ratio of top10% to bottom10%), generalized impulse responses, two standard deviation confidence intervals



V. Conclusion

We measured the impact of quantitative easing on consumption inequality in Japan using a VAR framework. Our results suggest that quantitative easing has slightly increased consumption inequality in Japan. Quantitative easing has affected inequality through GDP (negative), inflation (positive), and stock prices (negative). The inflation channel dominates the other channels and the overall effects of quantitative easing on consumption inequality, non-durable consumption inequality, and durable consumption inequality are all positive. Quantitative easing increased consumption inequality. However, these effects of quantitative easing on consumption inequality are quite small compared to the effects on income inequality found by other researchers for Japan. This suggests that the effect of quantitative easing on income inequality was temporary (permanent incomes did not change) and it did not translate into a similar change in consumption inequality. However, higher marginal propensity to consume of the households at the bottom of the income distribution compared to the households at the top likely contributed to this as well. Because the households at the bottom spent a higher share of their income gains compared to the households at the top, consumption inequality did not rise as much as income inequality.

Notes

1) See Friedman (1957).

2) Horioka (2021) concludes that the life-cycle model of saving and consumption is more applicable to Japan compared to Ricardian bequest model. This implies that people are more likely to increase their consumption after a rise in their wealth or incomes rather than saving to leave a bequest. Therefore, we should see a rise in consumption after a rise in wealth or incomes due to asset valuation, especially of the richer older people who are more likely to hold more assets and who have less years to spend their wealth. See also Flath (forthcoming, Ch. 5) for a discussion of saving and consumption in Japan.

3) Lise et al. (2014, pp. 587) find that both income and expenditure data in the Family Income and Expenditure survey "… appear to suffer from under reporting or possibly an under sampling of high-income households." However, they argue that this issue is not much worse for Japan compared with other countries. This means that using consumption data does not give an advantage over income data on this issue.

4) See Colciago et al. (2019) for a literature survey. They conclude that the distributional effects of both conventional and unconventional monetary policies are mixed.

5) See Hayashi (1985).

6) See Appendix 4 for details about consumption variables construction.

7) Lise et al. (2014) find that consumption data in FIES suffers from under-reporting or undersampling of rich households compared to national accounts data. However, they argue that this is not much worse for Japan compared to other countries. In contrast, the trend of consumption in FIES follows national accounts, which is more important for this study as explained before.

8) This type of VAR framework is widely used to assess the effects of monetary policy. See Bernanke and Blinder (1992) and Christiano et al. (1999) for more discussion. Saiki and Frost (2014, 2018) also use this model to estimate the impact of quantitative easing on income inequality in Japan.

9) See Appendix 1-3 for related test results.

10) See Appendix 5 for all the impulse response graphs.

11) See Pesaran and Shin (1998)

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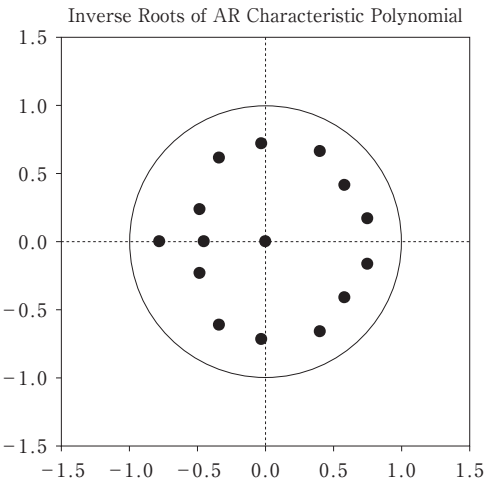
Appendix

Appendix 1. AR Roots Graph (3 lags)



Note: All values are within the circle-which shows that the VAR system is stable.

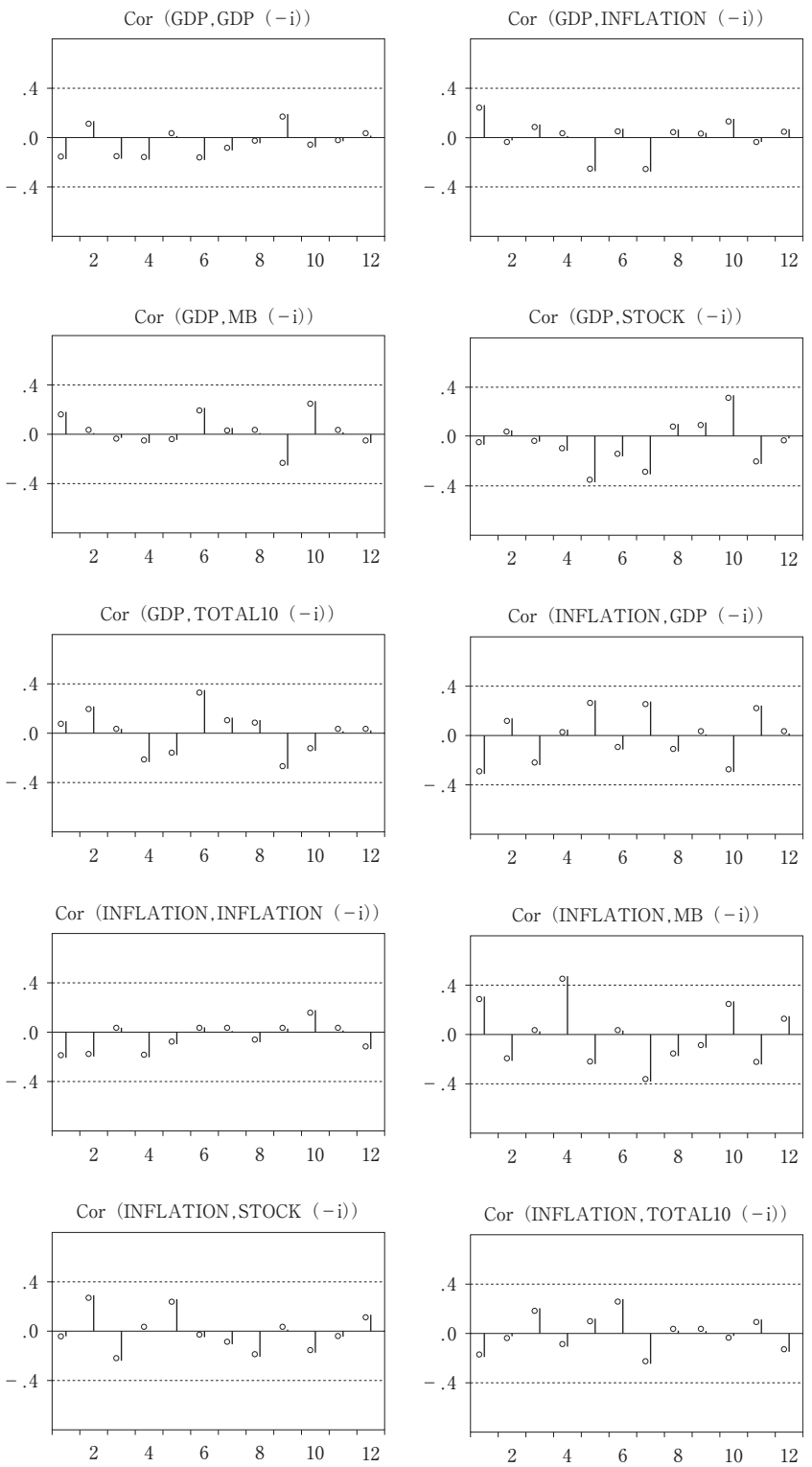
Appendix 2. VAR Residual Serial Correlation LM Tests

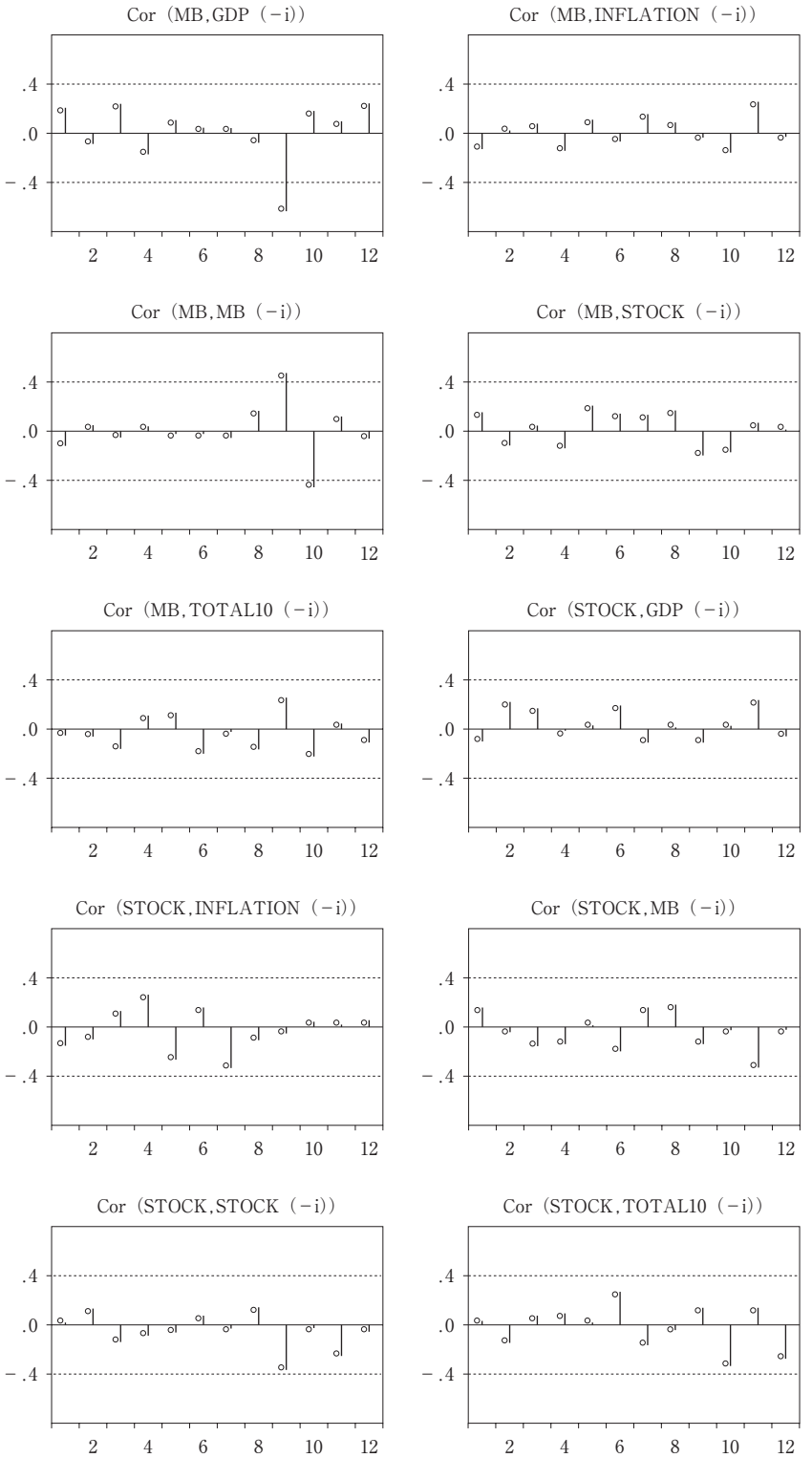
Null hypothesis: No serial correlation at lag h						
Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	30.96916	25	0.19	1.306131	(25, 53.5)	0.204
2	23.16425	25	0.568	0.916223	(25, 53.5)	0.5834
3	21.05999	25	0.6893	0.81887	(25, 53.5)	0.7021
4	34.85098	25	0.0909	1.518196	(25, 53.5)	0.1004
*Edgeworth expansion corrected likelihood ratio statistic.						

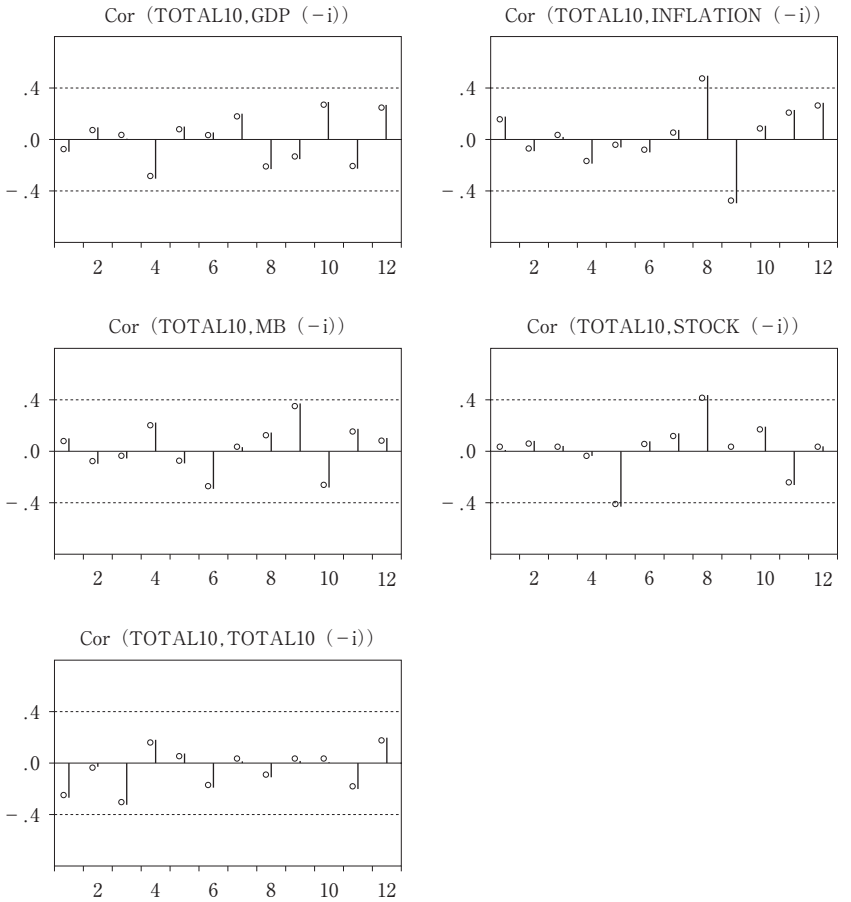
Note : We cannot reject the hypothesis that 'there is no serial correlation at lag 3', so we can say that there is no autocorrelation when using 3 lags.

Appendix 3. Correlograms

Autocomelations with Approximate 2 Std. Err. Bounds




Cor (MB,GDP (−i))
Cor (MB,INFLATION (−i))
Cor (MB,MB (−i))
Cor (MB,STOCK (−i))
Cor (MB,TOTAL10 (−i))
Cor (STOCK,GDP (−i))
Cor (STOCK,INFLATION (−i))
Cor (STOCK,MB (−i))
Cor (STOCK,STOCK (−i))
Cor (STOCK,TOTAL10 (−i))
.4
.0
−.4
2 4 6 8 10 12



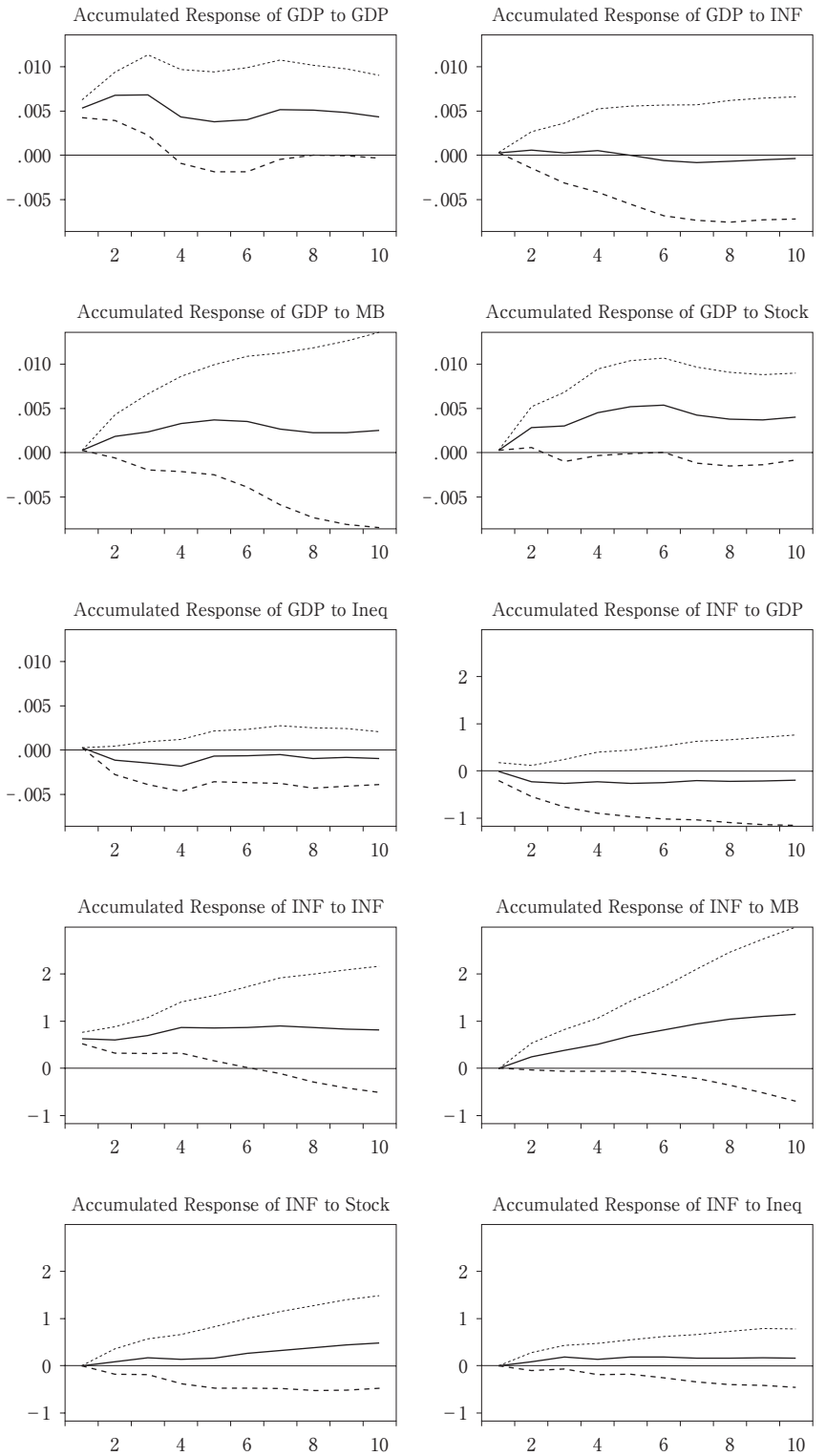
Note: All values (with a very few exceptions-which is not a problem) are within 2 standard error bounds. Furthermore, correlation coefficients are mostly very small and there is no apparent trend. Therefore, we can more confidently say that there is no autocorrelation in the VAR system.

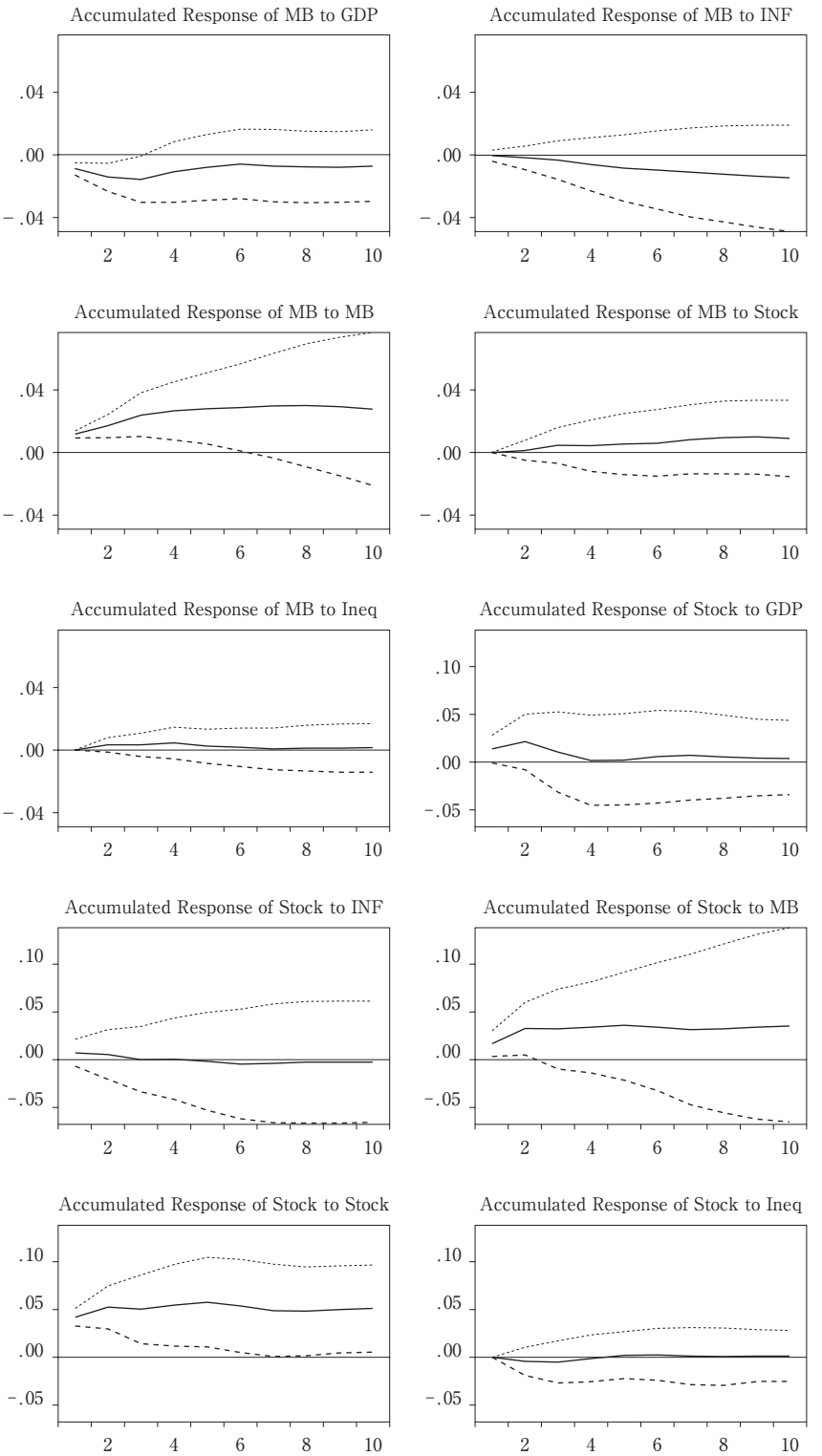
Appendix 4. Consumption Variables Construction

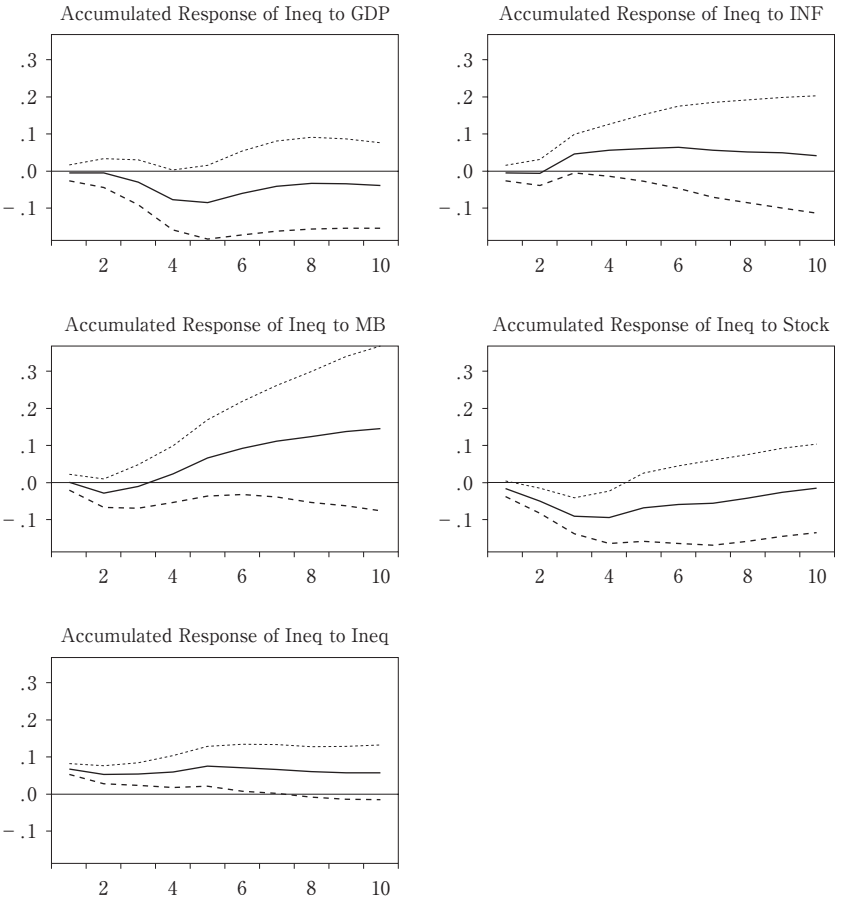
Durable Consumption		**Non-Durable Consumption**	
Category	FIES Code	Category	FIES Code
Rents for dwelling & land	2.1	Food	1
Household durable goods	4.1	Repairs & maintenance	2.2
Interior furnishing & decorations	4.2	Fuel, light & water charges	3
Bedding	4.3	Domestic utensils	4.4
Purchase of vehicles	7.2.1	Domestic non-durable goods	4.5
Purchase of bicycles	7.2.2	Domestic services	4.6
Recreational durable goods	9.1	Clothing & footwear	5
		Medical care	6
		Transportation & communication	7
		Education	8
		Recreational goods	9.2
		Books & other reading materials	9.3
		Recreational services	9.4
		Miscellaneous	10.1
		Pocket money (of which, detailed uses unknown)	10.2
		Social expenses	10.3

Note: Total Consumption is the sum of durable and non-durable consumption. We excluded 'remittance' (10.4). 'FIES' is the Family Income and Expenditure Survey.

Appendix 5. Impulse Responses (Baseline), Cholesky d.o.f. adjusted, two standard deviation confidence intervals




Accumulated Response of MB to GDP
Accumulated Response of MB to INF
Accumulated Response of MB to MB
Accumulated Response of MB to Stock
Accumulated Response of MB to Ineq
Accumulated Response of Stock to GDP
Accumulated Response of Stock to INF
Accumulated Response of Stock to MB
Accumulated Response of Stock to Stock
Accumulated Response of Stock to Ineq


Accumulated Response of Ineq to GDP
Accumulated Response of Ineq to INF
Accumulated Response of Ineq to MB
Accumulated Response of Ineq to Stock
Accumulated Response of Ineq to Ineq
.3
.2
.1
.0
−.1
2
4
6
8
10