

# Appendix to: The Myth of Financial Innovation and the Great Moderation

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## Abstract

The appendix explains how the data series are constructed, gives the IRFs for the remaining shocks and the IRFs for the separate real activity shocks, performs several robustness exercises, and discusses the similarities and differences between home mortgages and total mortgages, which also include commercial mortgages.

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## **B Constructing Time Series for Bank Mortgages**

In the Flow of Funds data set, there is an item for bank mortgages, but this item only includes the mortgages banks hold directly on their balance sheets. Therefore, it only provides limited information, because banks hold a lot more mortgages on their balance sheets in the form of asset-backed securities. In this section, we explain how we calculate the amount of mortgages banks hold indirectly on their balance sheets.

To decide what should be included, we checked schedules RC-B & RC-D of the Call reports on which this part of the Flow of Funds is based and the Guide to the Flow of Funds Accounts published by the Board of Governors of the Federal Reserve System.<sup>35</sup>

### **Schedule RC-B, item 4, mortgage-backed securities:**

#### 4.a. Pass-through securities

1. guaranteed by GNMA
2. issued by FNMA & FHLMC
3. other pass-through securities

#### 4.b. Other mortgage-backed securities (CMOs, REMICs, & Stripped MBSs)

1. issued or guaranteed by FNMA, FHLMC, or GNMA
2. collateralized by MBSs issued or guaranteed by FNMA & FHLMC
3. other MBSs

### **Schedule RC-D, item 4, mortgage-backed securities:**

#### 4.a. Pass-through securities issued or guaranteed by FNMA, FHLMC, or GNMA

#### 4.b. Other mortgage-backed securities issued or guaranteed by FNMA, FHLMC, or GNMA

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<sup>35</sup>Schedule RC-D provides information of assets held for trading, which are excluded in schedule RC-B.

4.c. All other mortgage-backed securities

For U.S.-chartered commercial banks, the Flow of Funds lists the following potentially relevant series in L.110:<sup>36</sup>

- row 7 Agency- and GSE-backed securities: Mortgage and GSE-backed securities; this item consists of items 4.a.1 and 4.a.2 of schedule RC-B and item 4.a of schedule RC-D
- row 8 Agency- and GSE-backed securities: CMOs and other structured MBS; this item consists of item 4.b.1 of Schedule RC-B and item 4.b of schedule RC-D.
- row 9 Agency- and GSE-backed securities: Other; these include U.S. government agency obligations and MBSs are explicitly excluded.
- row 12 Corporate and foreign bonds: Private mortgage pass-through securities; this item consists of item 4.a.3 of schedule RC-B and item 4.c of schedule RC-D.
- row 13 Corporate and foreign bonds: Private CMOs and other structured MBS; this item consists of item 4.b.2 of schedule RC-B.
- row 14 Corporate and foreign bonds: Other; this item consists of item 4.b.3 of schedule RC-B, but also of other items.
- row 16 Mortgages

Obviously, we have to exclude row 9. Row 14 includes some MBSs, namely those that are not pass-through securities *and* not related to GNMA, FNMA, or FHLMC,<sup>37</sup> but it also includes securities that are not related to mortgages.<sup>38</sup> Row 14 is not trivial in magnitude. In 2006, it was equal to 6% of the sum of rows 7, 8, 12, 13, and 16 and 22.6% of the sum when row 16 is excluded.

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<sup>36</sup>There are occasional changes in row numbers; our row numbers correspond to those of the March 2009 issue of the flow of funds.

<sup>37</sup>Namely Call Report series RCON 1733 and RCON 1735.

<sup>38</sup>In particular, it includes other debt securities, RCON 1737 & RCON 1739, and foreign debt securities, RCON 1742 & RCON 1744.

The largest part of row 14, however, is not related to mortgages. We obtained individual bank data from the Call Reports and aggregated them to obtain the six items that are part of row 14. At the end of our sample, roughly 40% of row 14 is related to mortgages. This means that the mortgage part of row 14 is roughly 1.5% of all U.S.-chartered mortgages and 9% of these banks MBSs.<sup>39</sup> Therefore, our total mortgage measure for U.S.-chartered commercial banks consists of rows 7, 8, 12, 13, and 16.

For savings institutions, the listed series in L.114 of the Flow of Funds are identical to those of U.S.-chartered banks and we construct our total mortgage measure for savings institutions in the same way.

For credit unions, the Flow of Funds lists in L.115 only the total amount of pass-through securities and the total for other mortgage-backed securities. For credit unions we, therefore, only use home mortgages (row 10) and agency-and GSE-backed securities (row 8). We would miss the MBSs in corporate and foreign bonds (row 9), but this balance sheet item is very small relative to both the quantities in row 8 and row 10.

## C Real Activity Shocks

Our VAR contains three real activity variables: residential investment, durable expenditures and GDP. For each of these variables, our Cholesky decomposition gives rise to an associated shock. In the main part of this paper, we analyse the IRFs when *each* of the three innovations is equal to one standard deviation. In this appendix, we discuss the responses to the three individual shocks. The corresponding IRFs are shown in Figures 11, 12 and 13.

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<sup>39</sup>It is not difficult to do such an exercise for one period, but it is to do it for a whole time series. The problem with the Call Reports is that it is not trivial to construct consistent time series because the definitions often change.

**Residential investment shock.**

There are several similarities in the shapes of IRFs across the two subsamples. The main change seems to be that the magnitudes of the responses have declined, which resembles the results for a joint real activity shock.

In the first subsample, the three real activity variables as well as the two loan components display an initial decrease followed by a quite substantial increase. Similar to the change observed for the responses to a joint real activity shock, the responses of home mortgages to a residential investment shock seem to have shifted upward and turn positive earlier. In itself this is consistent with financial innovation, but comparing the IRFs for residential investment and GDP across the two samples indicates that there is not a substantial reduction in the economic downturn and that the drop in GDP even has become a lot more persistent. Relative to the IRFs reported in the main text for a real activity shock, these results provide less evidence in favor of the hypothesis that financial innovation is behind the reduction in the volatility of real activity.

**Durable expenditures shock.**

When we compare the changes in the IRFs of durable expenditures and GDP to a durable expenditures shock with the changes in the IRFs to a real activity shock, then we find that the reduction of the negative responses are stronger for the first set. This would strengthen the case for financial innovation having had a favorable impact on business cycle behaviour. When we compare the responses of consumer credit to a durable expenditures shock with the responses of consumer credit to a real activity shock, however, then we find that the responses to a durable expenditures shock are very similar across the two subsamples. With an almost equal reduction in consumer credit, it seems unlikely that financial innovation is behind the smaller reductions in real activity.

### **GDP shock.**

At first sight, the changes in the IRFs following a GDP shock do seem to support the view that financial innovation had a favorable impact on the transmission of this shock on the economy. That is, in response to a negative GDP shock home mortgages increase faster in the second subsample and so does the IRF of residential investment; GDP and durable expenditures drop by less in the second subsample. In the second subsample, however, the negative drop in GDP leads to a more persistent drop in the federal funds rate and this could also be behind the observed changes in home mortgages and residential investment.

## **D Other Shocks**

In the main text, we discussed the responses to a monetary tightening and a joint real activity shock. In this section, we discuss the responses to the other shocks. The IRFs are plotted in Figures 14, 15, and 16.

### **D.1 IRFs of Other Shocks**

#### **Price shock.**

Most of the responses are insignificant in the subsamples. Interestingly, the responses are often significant over the complete sample, which also includes the period from 1979Q1 to 1983Q4 during which inflation was sharply reduced. None of the two subsamples include this period. One interesting observation is that in the second subsample there is a significant monetary tightening in response to a positive price shock, whereas in the first subsample, there is an insignificant decline of the federal funds rate. This observation is consistent with the hypothesis that keeping inflation low has become more important for policy makers. Although we found that in the second subsample an unexpected monetary tightening does not have a significant downward effect on durable

expenditures, the increase in prices combined with a monetary tightening does still lead to a substantial reduction in durable expenditures.

### **Consumer credit shock.**

Except for the responses of consumer credit itself, almost none of the responses are significant, which is consistent with the result discussed in the main text that consumer credit does not seem to have a strong effect on the real economy.

### **Home mortgage shock.**

The responses to a home mortgage shock are also not significant that often (except for the responses of home mortgages itself), but there are still somewhat more significant responses for a home mortgage shock than for a consumer credit shock. One striking observation is that in the second subsample both the negative response of home mortgages itself and the negative response of residential investment have become more persistent. This is, of course, not very supportive of the view that financial innovation dampened economic fluctuations. It is interesting to note that a negative disturbance in home mortgages did correspond with a (short-lived) reduction in durable expenditures and GDP in the first subsample, but that the responses of these two variables are basically flat in the second subsample. A possibly related observation is that in the first subsample consumer credit decreases together with home mortgages, although the reduction is not significant. In contrast, in the second subsample there is a sharp and significant increase in consumer credit. One possible interpretation is that in the first subsample disturbances in the market for home mortgages spread across markets, but that in the second subsample reductions in home mortgages gave rise to positive opportunities in other financial markets.

## **D.2 IRFs of Other Shocks and Financial Innovation**

### **Price shock.**

The changes in the IRFs after a price shock are close to the opposite of what one would expect if financial innovation had affected business cycle properties. In particular, the consumer credit response has become more negative and the GDP response has become less negative (although possibly more persistent). Moreover, the response of durable expenditures is small and insignificant in the first subsample, but more negative and significant in the second subsample. A much more straightforward explanation for this change is that the FED has become more responsive to inflationary pressure, which explains the upward shift of the response of the federal funds rate, which in turn explains the downward shift of the responses of consumer credit and durable expenditures. Although the responses are not significant, a similar set of results is found for mortgages and residential investment.

### **Consumer credit shock.**

The drop in consumer credit has only become larger and more persistent, whereas the IRFs of the three real activity variables have become more muted, which does not fit the standard story that better access to loans has dampened economic fluctuations. Given that the responses are typically not significant, however, there is little point in taking the changes seriously.

### **Home mortgage shock.**

The most interesting change is that in the second subsample there is a negative comovement between home mortgages and consumer credit. This substitution between different types of loans could be a sign of financial innovation. For example, financial institutions may have better substitution possibilities and channel funds towards consumer credit when there are disruptions in the



market for home mortgages. This substitution could then very well amplify the downturn in home mortgages and the downturn in residential investment, which is consistent with the IRFs. Better possibilities for financial institutions to adjust their loan portfolios could be beneficial for financial institutions. It is not clear, however, how such substitutions between one type of consumer loan for another benefit consumers and this pattern does not correspond with the view expressed in the literature that financial innovation made it easier for consumers to keep on borrowing during bad times.

## **E Robustness**

### **E.1 Alternative Filter to Calculate Business Cycle Statistics**

Table 2 reports some key business cycle statistics when a band-pass filter instead of the HP filter is used. Our band-pass filter lets pass through that part of the time series associated with cycles with a period between 6 and 32 quarters.<sup>40</sup> The HP filter is an approximate band-pass filter that focuses on cycles with a period less than 32 quarters. Since short-term cycles may be quite noisy and for example be affected by measurement error, it is important to document that the results are robust to this alternative procedure to construct cyclical components.

The table documents that our results do not depend on which filter is used.

### **E.2 Lack of Robustness of Second Subsample GDP Responses**

In the second subsample, the response of GDP following a monetary tightening is slightly positive and significant. This is not a robust result. Alternative VAR specifications can give significantly negative responses. The results in Figure 17 are from a VAR identical to the one used in the main text, but

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<sup>40</sup>The ideal band-pass filter is an infinite-order two-sided filter. To be able to implement the filter we truncate it at 8 quarters and then rescale the coefficients so that they still add up to zero. We experimented with alternative truncation choices and found the results to be similar.

without a deterministic trend. Excluding the deterministic time trend makes the responses across the two samples more similar, especially if we would equalize the size of the shock in the federal funds rate. GDP now starts to decrease in the first two quarters and the responses are significant after two years. The responses of durable expenditures as well as those for consumer credit are also significantly negative for this VAR specification. The negative response for home mortgages is stronger. The results generated by this VAR are even less in favor of financial innovation affecting business cycles. The results in Figure 18 are based on the same VAR except that the deflator is excluded. Now the negative responses of both the real activity and the consumer loan variables are even stronger. Scaled for the size of the federal funds rate shock, the drop in home mortgages would be much larger in the second than in the first subsample.

The finding that there are simple VAR specifications in which there are still sizeable drops in both real activity and consumer loans following a monetary tightening question the validity of the hypothesis that it has become easier for consumers to keep on borrowing during a monetary tightening and that in turn this reduced the magnitude of the economic downturn. Our interpretation of the empirical evidence is the following. In the second subsample, there is no robust evidence that real activity (except residential investment) declines following a monetary tightening. The conditional comovement between real activity and consumer loans does not seem to have changed, however. That is, whenever a VAR generates a sizeable drop in real activity, it also generates a sizeable drop in the two consumer loans. If a VAR does not generate a sizeable drop in all real activity variables, it may also not generate a sizeable drop in both types of consumer loans.

If consumer credit, durable expenditures, and GDP, all drop following a monetary tightening, as documented in Figure 18, then the question arises whether the correlation of the forecast errors still drops. The covariances

according to the VAR underlying this figure are reported in Figure 19 together with the role of the monetary policy and the real activity shock. The covariance of consumer credit with both durable expenditures and GDP still drops, but clearly not as much as for the VAR used in the main text. That is, there are covariance measures between consumer credit and real activity that do not even drop, further weakening the evidence for the hypothesis that financial innovation played a role in the great moderation. Interestingly, the smaller drop in the correlation coefficients according to this VAR is *not* due to the IRFs of consumer credit and the real activity variables all dropping during a monetary tightening. The lesser importance of the monetary policy shock and the delayed drop in consumer credit keeps the covariance due to monetary policy shocks low. Figure 19 shows that this comovement measure does not drop by this much because according to this VAR the comovement driven by real activity shocks does not drop by much and at higher forecast horizons even increases. This is not that surprising. In the main text, we documented that small changes in these IRFs could have large effects on the correlation between the forecast errors, because the IRFs switched sign and that the turning point moved over time, but differently for different variables. Then one can expect that the changes in the correlation coefficients are not that robust, which we show here is indeed the case.

### **E.3 Alternative VAR Specifications**

We found that our main results are robust to several changes in the specifications of the VAR. In particular, across specifications we find that there is a sizeable drop in home mortgages and residential investment following a monetary tightening in both the first and the second subsample and that real activity variables have a strong effect on loan variables, but not vice versa. In Section E.2, we already discussed the results when no deterministic trend was included and when the price deflator was not included. In this section, we

document the results for some of the alternative specifications considered.

### **Including house prices.**

One obvious alternative to consider is a VAR that includes an index for house prices. Figure 20 reports the IRFs for the real house price, residential investment, and home mortgages when the OFHEO house price index, deflated by the GDP deflator, is added to the VAR. The panels for residential investment and home mortgages also plot the IRFs when the VAR does not include the house price index, that is, the IRFs from Figure 4. Because of data limitations, we can only obtain these IRFs for the second subsample. The graph documents that a monetary tightening leads to a significant but small drop in house prices. Moreover, the IRFs of residential investment and home mortgages are not affected very much.<sup>41</sup>

### **Different number of lags.**

Our benchmark VAR specification follows common practice and includes four lags of each variable. A smaller number of lags is preferred in several of the equations according to both AIC and BIC. To make sure that our results are robust to the number of lags, we report in Figure 21 the results for a monetary tightening when only two lags are included. The results are very similar except that with two lags the upward shift in the responses of residential investment is smaller. Since such an upward shift could be interpreted as evidence in favor of the hypothesis that financial innovation dampened business cycles, the smaller upward shift only strengthens our case.

### **Different ordering.**

Our identification procedure relies on the assumption that variables do not respond to a monetary policy shock within the quarter is correct. To increase

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<sup>41</sup>The results for the other variables are quite similar to those reported in Figure 4.

the plausibility of this hypothesis, we use the average daily federal funds rate during the *last* month of the quarter as our monetary policy instrument. To be on the safe side, we also consider an alternative identification assumption under which the two loan variables are able to respond within the quarter. The responses following a monetary tightening are shown in Figure 22. The figure documents that the results are very similar, except that the responses for consumer credit are now slightly positive instead of hovering around zero. These responses are insignificant, under both identification assumptions.

### **Using house sales instead of residential investment.**

Figure 23 shows the results if we use home sales instead of residential investment. Residential investment is the more appropriate measure for a study like ours, since we are interested in studying the interaction between consumer lending and real activity. But it is also interesting to investigate the behaviour of home sales and whether its time series properties have changed.

Figure 23 shows the responses following a monetary tightening. We find that most results are qualitatively very similar. Note that the comparison is hampered somewhat by the fact that the first observation of the first subsample is somewhat different.<sup>42</sup> The most interesting difference between these and our benchmark results is that the price puzzle that we encountered in the first subsample has disappeared.

### **Including the Greenbook forecast for inflation.**

As documented in Figure 4, the price response following a monetary tightening suffers from the price puzzle. A possible explanation for this increase is that the identified shock is not really a true innovation to monetary policy,

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<sup>42</sup>Our time series for home sales only starts in 1968Q1. This shorter sample may also be the reason for the fact that the estimated responses are outside the confidence band, since the most likely cause for this is small-sample bias.

but (in part) a response to inflationary pressure. To check this possibility, we include the Greenbook measure of expected inflation. The results are shown in Figure 24. The figure plots the responses when the Greenbook forecast of inflation is included and when it is not. The responses when the Greenbook forecast is not included are not exactly equal to the ones from our benchmark specification, because here we give the results when the VAR is estimated over the period for which the Greenbook forecast is available. In particular, the first subsample now starts in 1968Q4 and ends in 1978Q4 and the second subsample starts in 1984Q1 and ends in 2003Q4. First note what the change in the dating of the subsamples has done for the price puzzle for the original specification, i.e., when the Greenbook forecast is not included. When the first subsample is shortened, then the price puzzle is still present, but it is weaker since the price response does turn negative a bit earlier. While we find no price puzzle when the second subsample ends in 2008Q1, we do find a price puzzle when the second subsample ends at the earlier date used here. Including the Greenbook forecast to the VAR has only a minor effect on the price responses for the results for the subsamples. That is, it does not alleviate the price puzzle to a considerable degree. This stands in sharp contrast with the results for the full sample in which inclusion of the Greenbook forecast eliminates the price puzzle completely.

## **F Home Versus Total Mortgages**

For the exercises in the main text related to bank and non-bank mortgages we used total mortgages, because we could not distinguish between home and other mortgages. In this section, we discuss the similarities and differences between the different mortgage series at the aggregate level.

### **Trends.**

Figure 25 is the equivalent of Figure 1, but uses home and non-home mort-

gages instead of total mortgages.<sup>43</sup> The figure shows that most the long-term increase in total mortgages is clearly due to the increase in *home* mortgages. Similar to the results found for total mortgages, this increase in home mortgages is mainly due to an increase in mortgages that are not directly owned by banks.

### **Cyclical behaviour.**

Figure 26 plots the cyclical components of home mortgages and GDP (in panel A) and the cyclical components of non-home mortgages and GDP (in panel B). A comparison with Figure 2 makes clear that the cyclical behaviour of home mortgages is very similar to that of total mortgages throughout the sample. In particular, the correlation of the cyclical components of home and total mortgages is equal to 0.97 in the first subsample and 0.92 in the second subsample. The correlation between home and non-home mortgages for the second subsample is clearly smaller than the correlation for the first subsample. This does not lead to a strong decrease in the correlation between home and total mortgages, because the share of home mortgages in total mortgages is substantially higher in the second subsample.

Figure 26 documents that the cyclical behaviour of home mortgages often resembles that of non-home mortgages, but there are some important differences. In particular, the run-ups in mortgages before the 1990-91 and the 2001 recession are not as large for home mortgages as for non-home mortgages, whereas the run-up before the recent turmoil is substantially larger for home mortgages.

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<sup>43</sup>For these series we cannot determine all bank-owned mortgages. The series that are indicated as "regular bank mortgages" in the graphs only include mortgages banks hold directly on their balance sheets.

### **Impulse response functions.**

In the first subsample, the IRFs of home, non-home, and total mortgages are all significantly negative. Panel A of Figure 27 plots the IRFs for these three series for the second subsample. As discussed above, the IRF for home mortgages following a monetary tightening is still significantly negative in the second subsample. The IRF for total mortgages, however, is basically flat and the IRF for non-home mortgages even displays a substantial increase. This is likely to be due to the boom and bust in commercial mortgages in the early nineties. As documented in Figure 26, the cyclical component of non-home mortgages increases at the end of the eighties and remains high for an unusually long time. In fact, it remains high even when the economy is going through a downturn. Note that there is a boom in home mortgages too, but of much smaller magnitude and this one ends much earlier. The boom in non-home mortgages is followed by a bust, also of an unusually long time. That is, non-home mortgage lending was buoyant following the increases in the federal funds rate in the second half of the eighties and suppressed following the reductions in the federal funds rate in the early nineties.

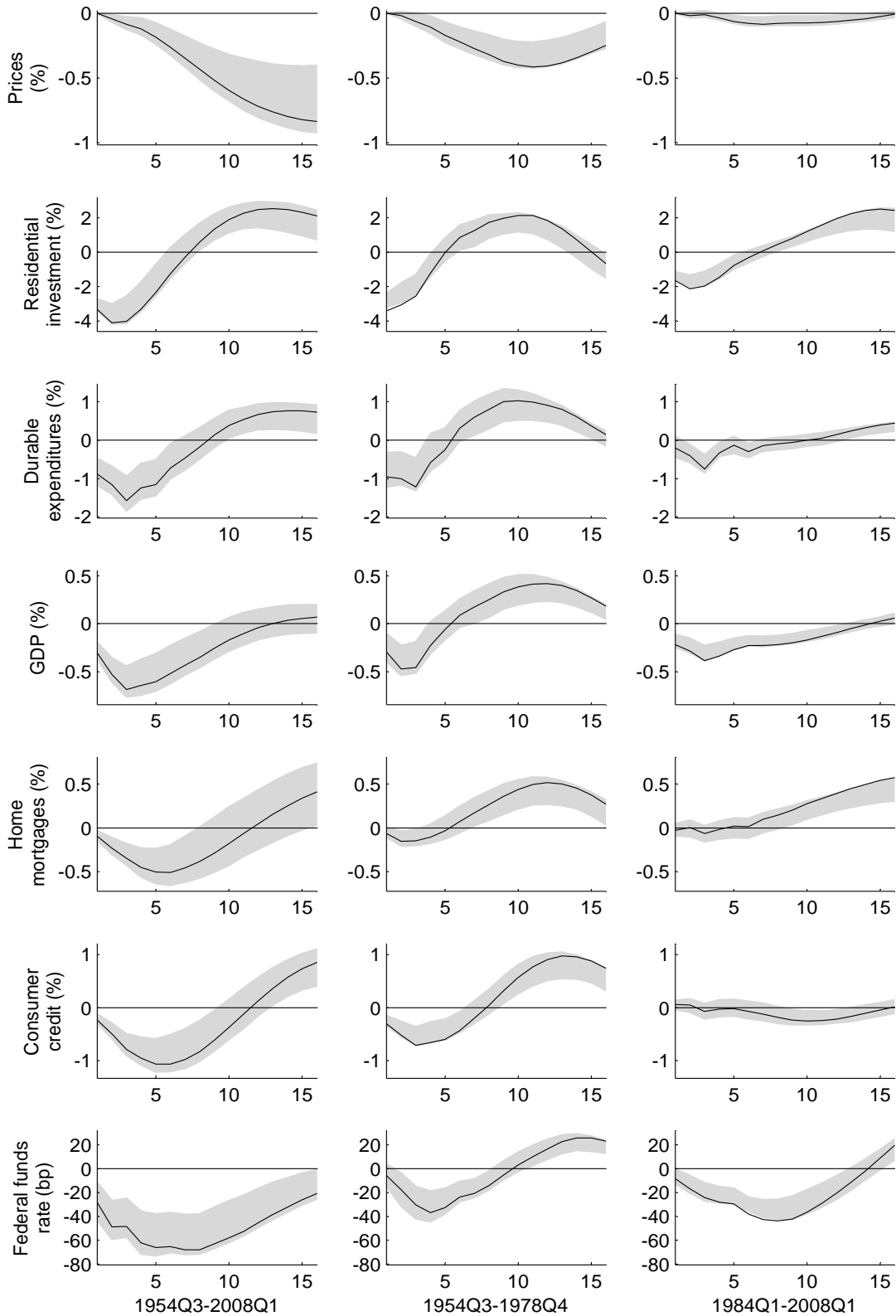


Table 2: Standard Deviations (in %) according to the band-pass filter

|                                   | '54Q3-'78Q4          | '84Q1-'08Q1 | change |
|-----------------------------------|----------------------|-------------|--------|
|                                   | standard deviations  |             |        |
| Real activity                     |                      |             |        |
| GDP                               | 1.38                 | 0.63        | -54%   |
| Durable expenditures (DE)         | 3.75                 | 1.71        | -55%   |
| Residential investment (RI)       | 7.68                 | 3.94        | -49.%  |
| Consumer credit                   |                      |             |        |
| Total (T)                         | 2.41                 | 1.57        | -35%   |
| Regular bank consumer credit (RB) | 2.59                 | 2.04        | -22%   |
| (T) - (RB)                        | 3.71                 | 2.95        | -21%   |
| Mortgages                         |                      |             |        |
| Total (T)                         | 1.21                 | 0.68        | -35%   |
| Regular bank mortgages (RB)       | 1.83                 | 1.52        | -17%   |
| All bank-owned mortgages (B)      | 1.84                 | 1.30        | -30%   |
| (T) - (RB)                        | 0.79                 | 1.10        | 40%    |
| (T) - (B)                         | 0.88                 | 1.43        | 63%    |
|                                   | correlation with GDP |             |        |
| Real activity                     |                      |             |        |
| Durable expenditures (DE)         | 0.90                 | 0.66        | -26%   |
| Residential investment (RI)       | 0.66                 | 0.54        | -18%   |
| Consumer credit                   |                      |             |        |
| Total (T)                         | 0.67                 | 0.08        | -88%   |
| Regular bank consumer credit (RB) | 0.68                 | 0.32        | -53%   |
| (T) - (RB)                        | 0.43                 | -0.26       | -161%  |
| Mortgages                         |                      |             |        |
| Total (T)                         | 0.75                 | 0.16        | -78%   |
| Regular bank mortgages (RB)       | 0.76                 | 0.51        | -34%   |
| All bank-owned mortgages (B)      | 0.78                 | 0.39        | -50%   |
| (T) - (RB)                        | 0.21                 | -0.37       | -278%  |
| (T) - (B)                         | 0.09                 | -0.29       | -427%  |

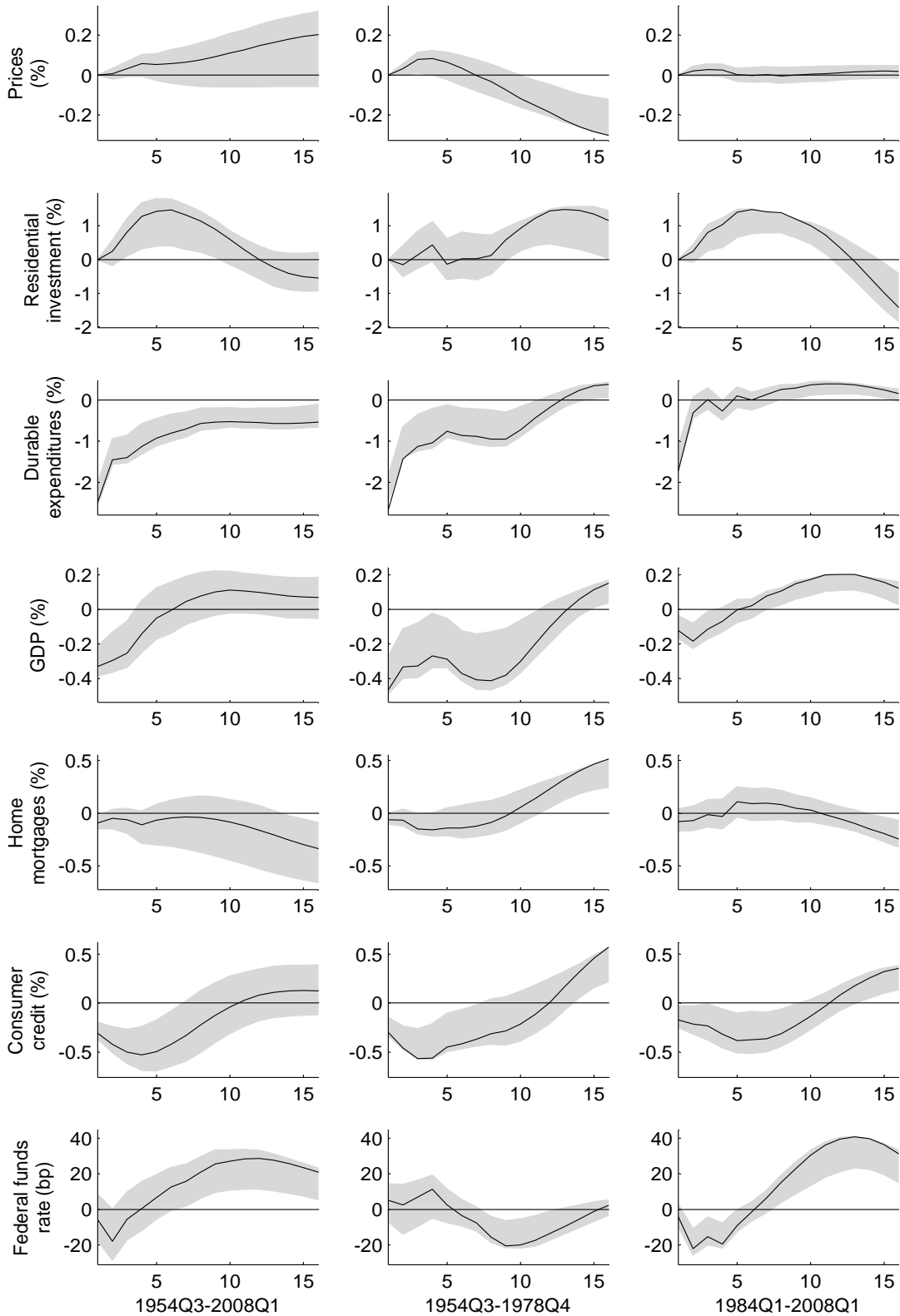
Notes: The table reports statistics for the cyclical component of the indicated variable. The cyclical component is calculated using a band-pass filter that let pass through the part of the series associated with cycles with a period in between 6 and 32 quarters. To implement the filter, which is an infinite-order two-sided filter, we truncate after 8 quarters and rescale the coefficients so that they still add up to zero. "regular" bank loans are those directly held on the banks' balance sheets and not in the form of asset-backed securities. For mortgages the latter could be calculated and are included in "all" bank mortgages.

Figure 11: IRFs following a residential investment shock



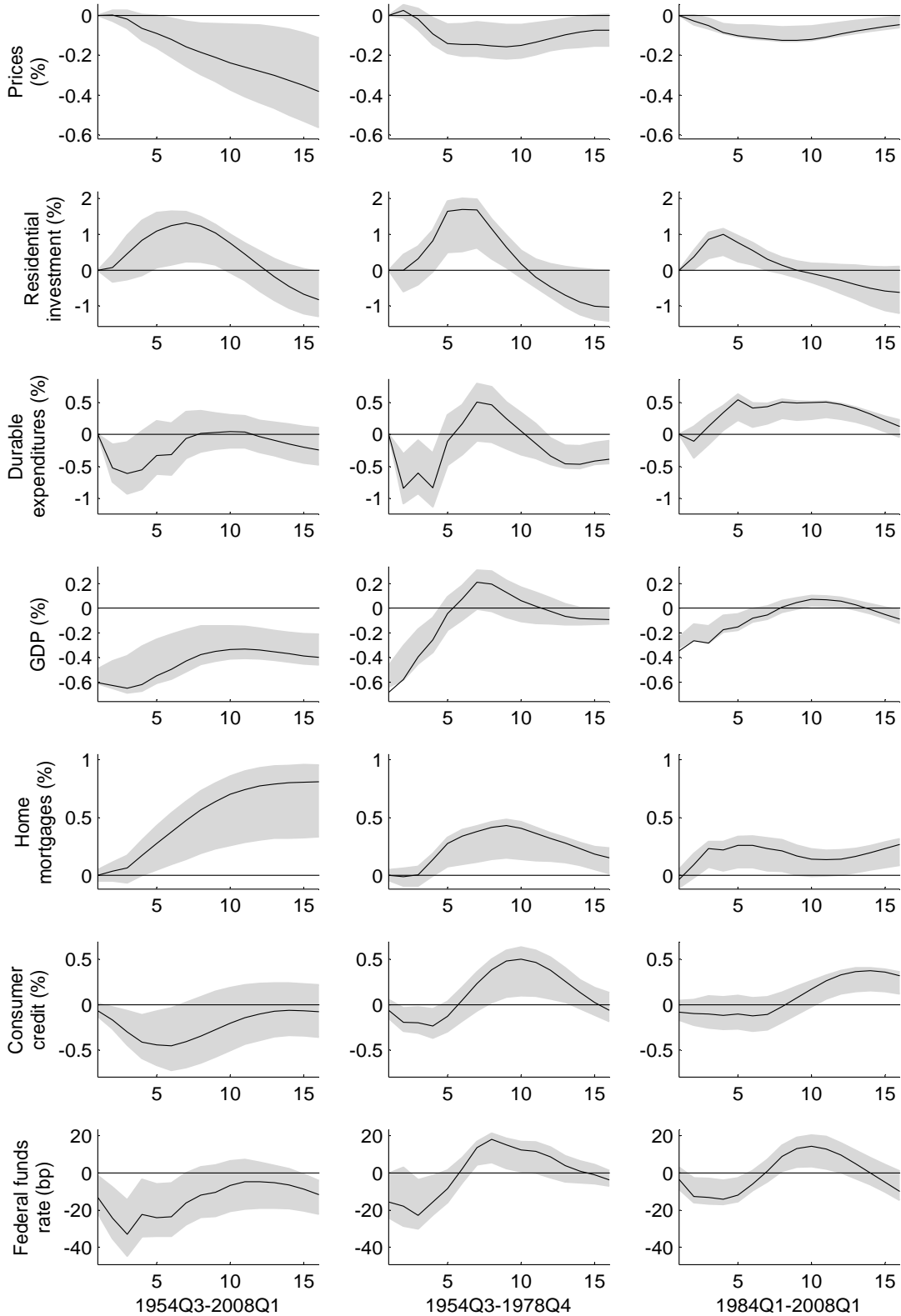
Notes: Responses to a one-standard-deviation shock in residential investment.

Figure 12: IRFs following a durable expenditures shock



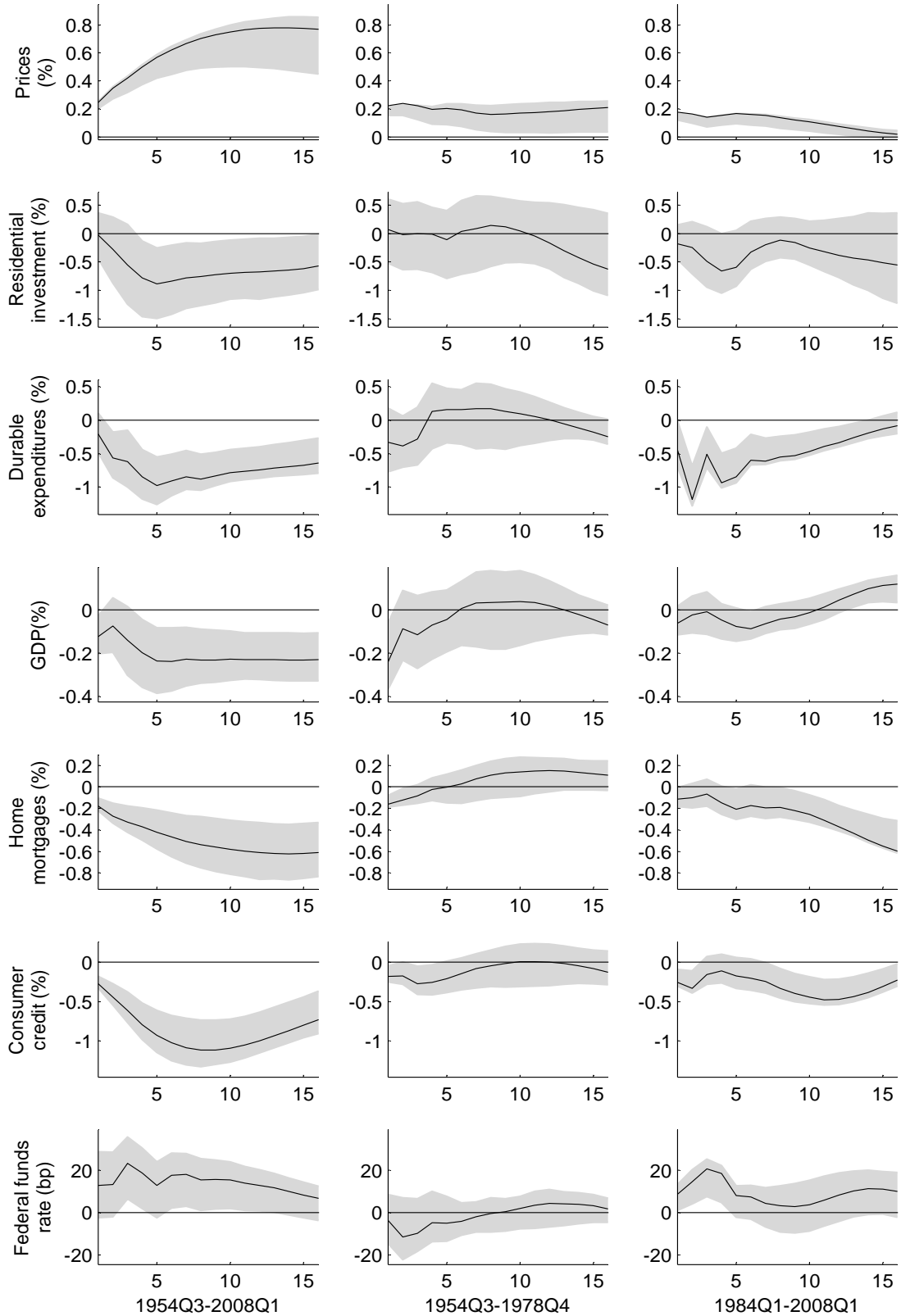
Notes: Responses to a one-standard-deviation shock in durable expenditures.

Figure 13: IRFs following a GDP shock



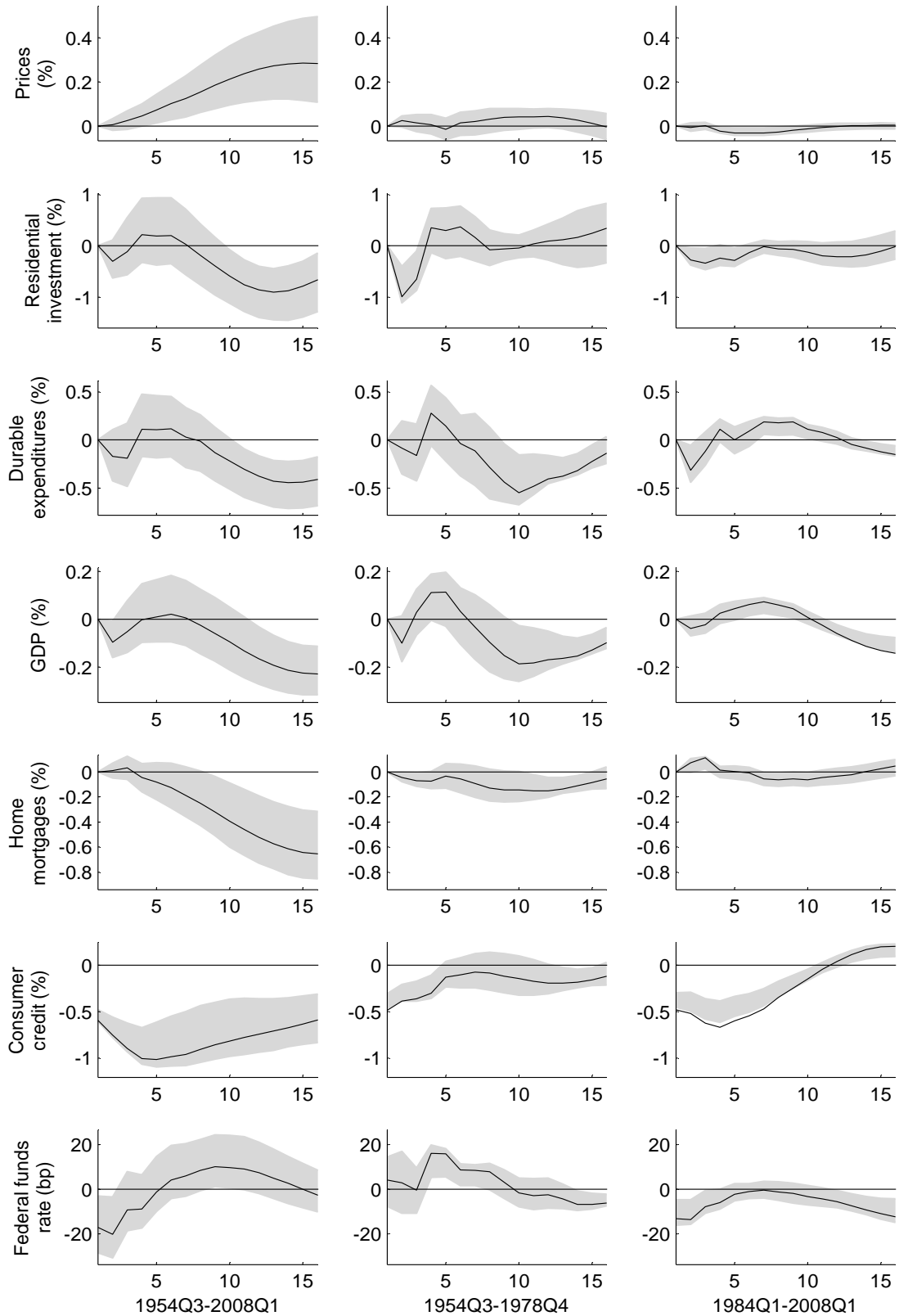
Notes: Responses to a one-standard-deviation shock in GDP.

Figure 14: IRFs following a price level shock



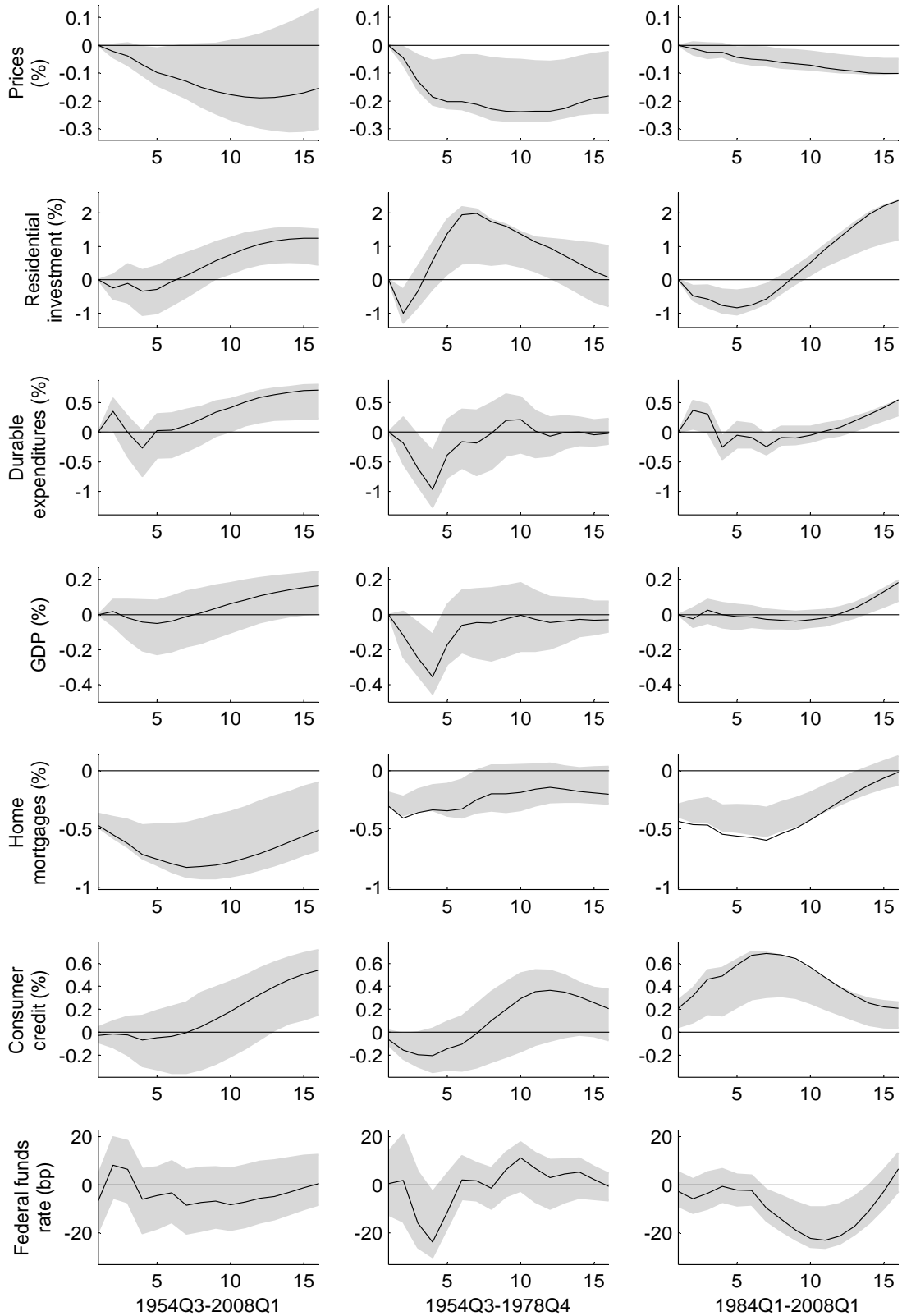
Notes: Responses to a one-standard-deviation shock in the price level.

Figure 15: IRFs following a consumer credit shock



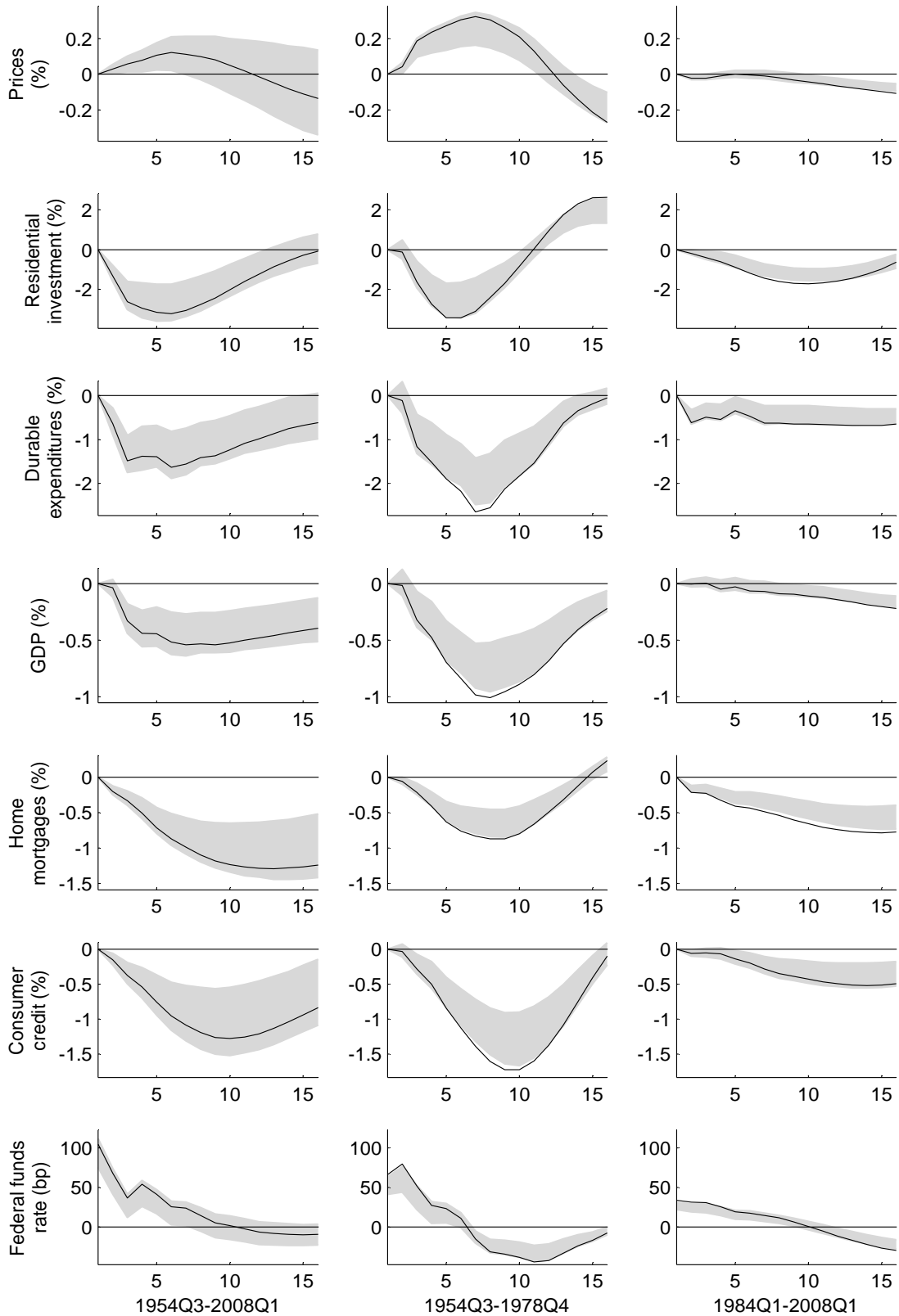
Notes: Responses to a one-standard deviation shock in consumer credit.

Figure 16: IRFs following a home mortgage shock



Notes: Responses to a one-standard-deviation shock in home mortgages.

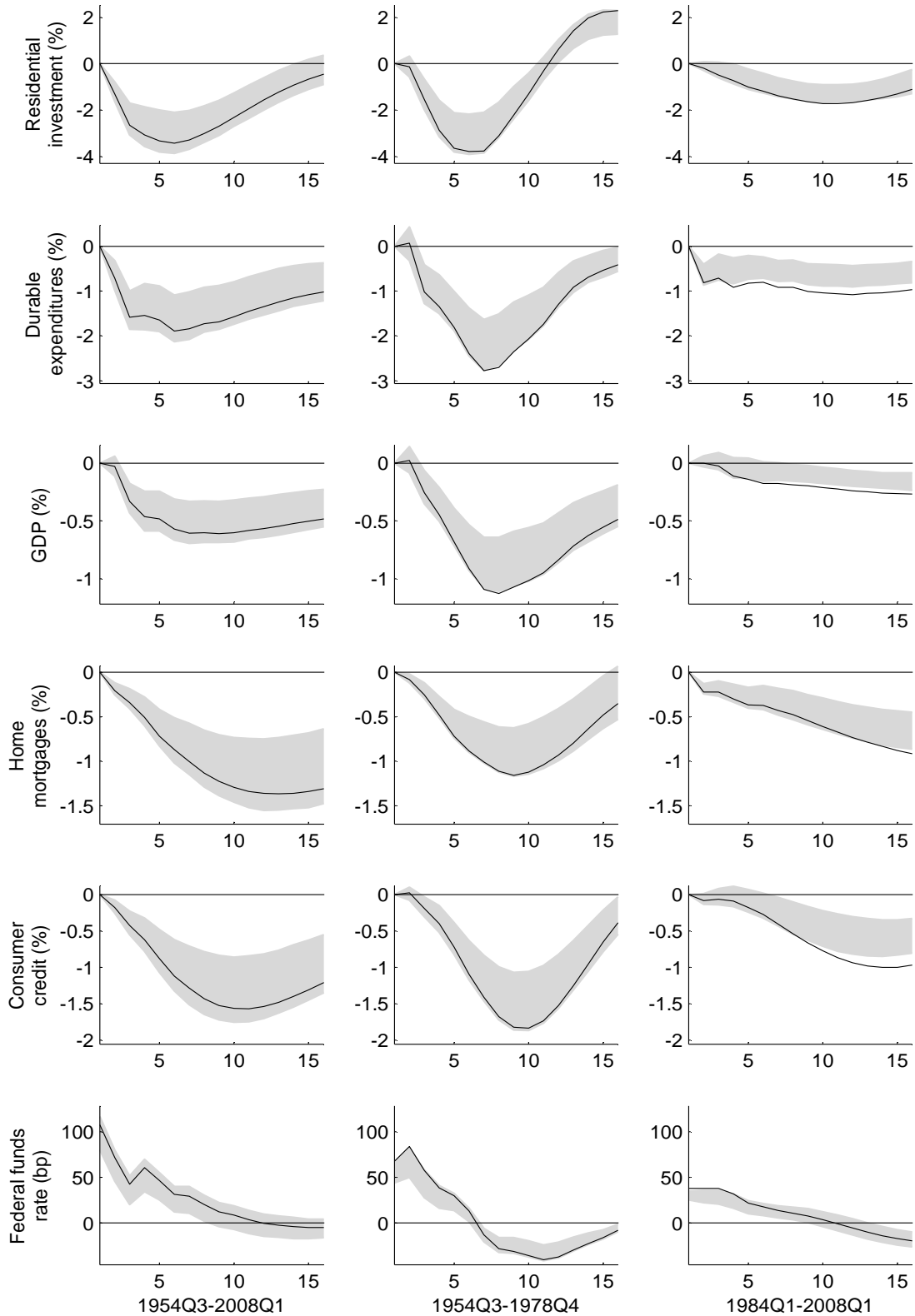
Figure 17: IRFs following a monetary tightening; no deterministic time trend



Notes: Responses to a one-standard-deviation shock in the federal funds rate. The IRFs are generated by a VAR with the same specification as the one used in the main text, except that no deterministic time trend is included.



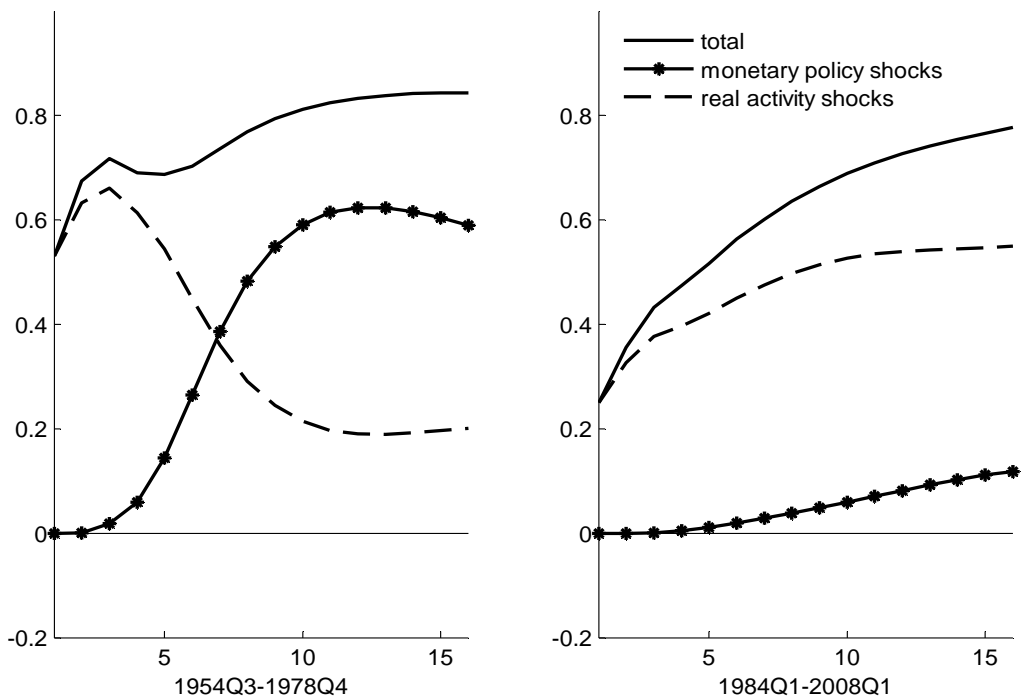
Figure 18: IRFs following a monetary tightening; no deterministic time trend and deflator



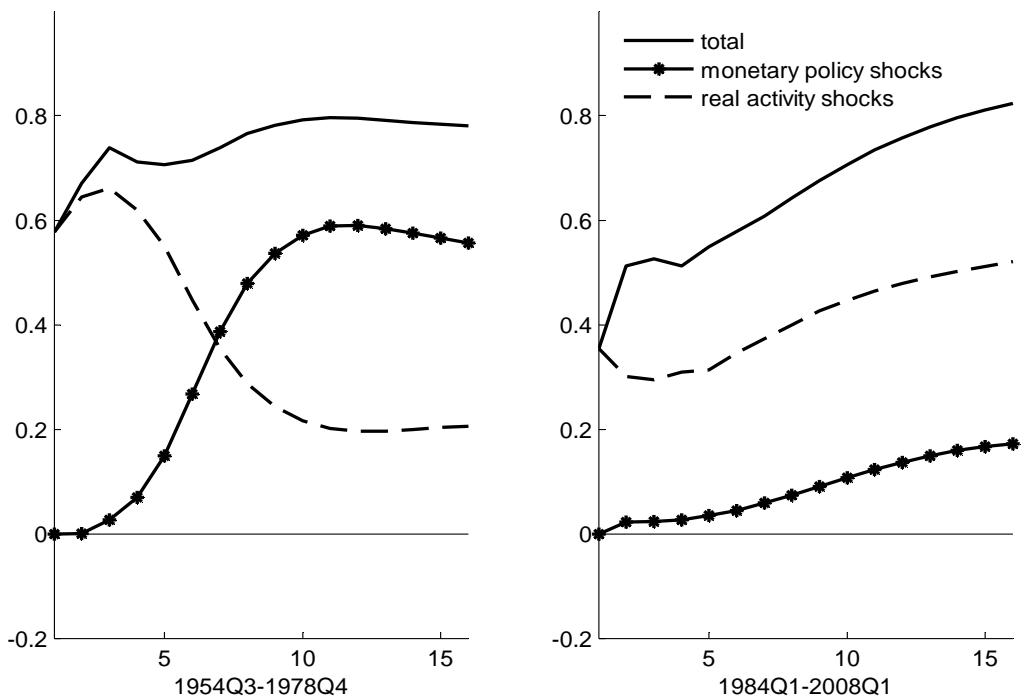
Notes: Responses to a one-standard-deviation shock in the federal funds rate. The IRFs are generated by a VAR with the same specification as the one used in the main text, except that neither the deterministic time trend nor the deflator is included.

Figure 19: Decomposition of comovement between consumer credit and real activity; no deterministic time trend and deflator

A. Correlation consumer credit and GDP

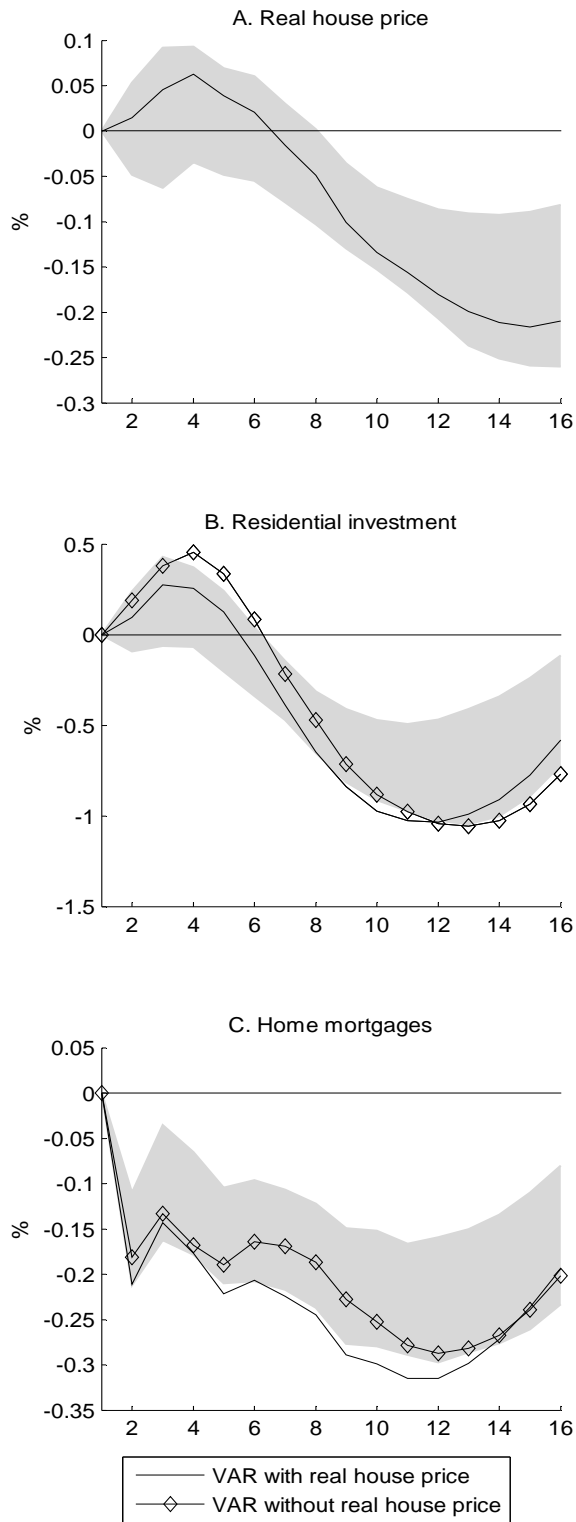


B. Correlation consumer credit and durable expenditures



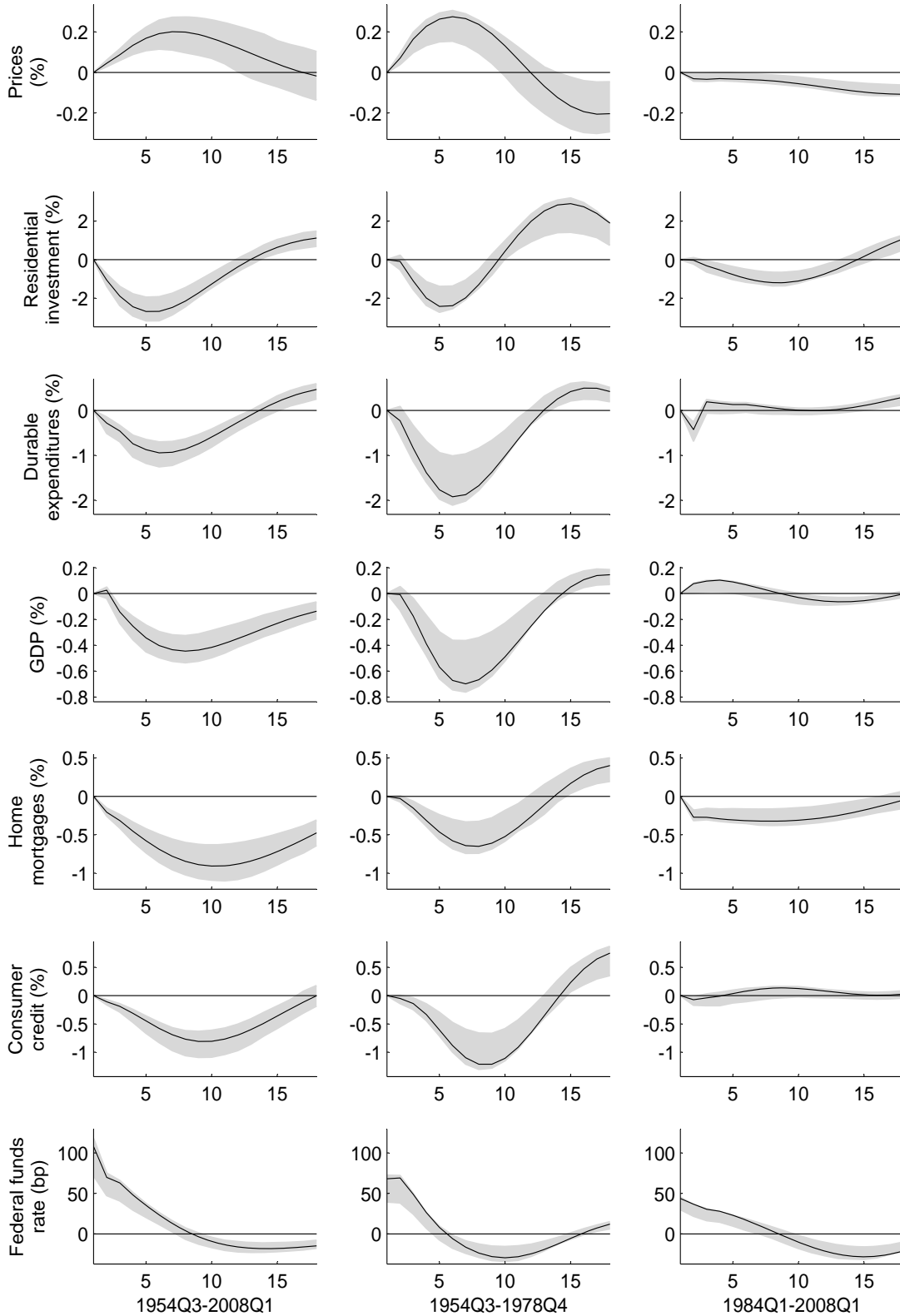
Notes: Correlation of forecast errors according to the VAR that is identical to the benchmark VAR, except that neither the deterministic time trend nor the deflator is included. The graph also indicates which part of the correlation is due to monetary policy and real activity shocks.

Figure 20: IRFs following a monetary tightening; VAR with house price



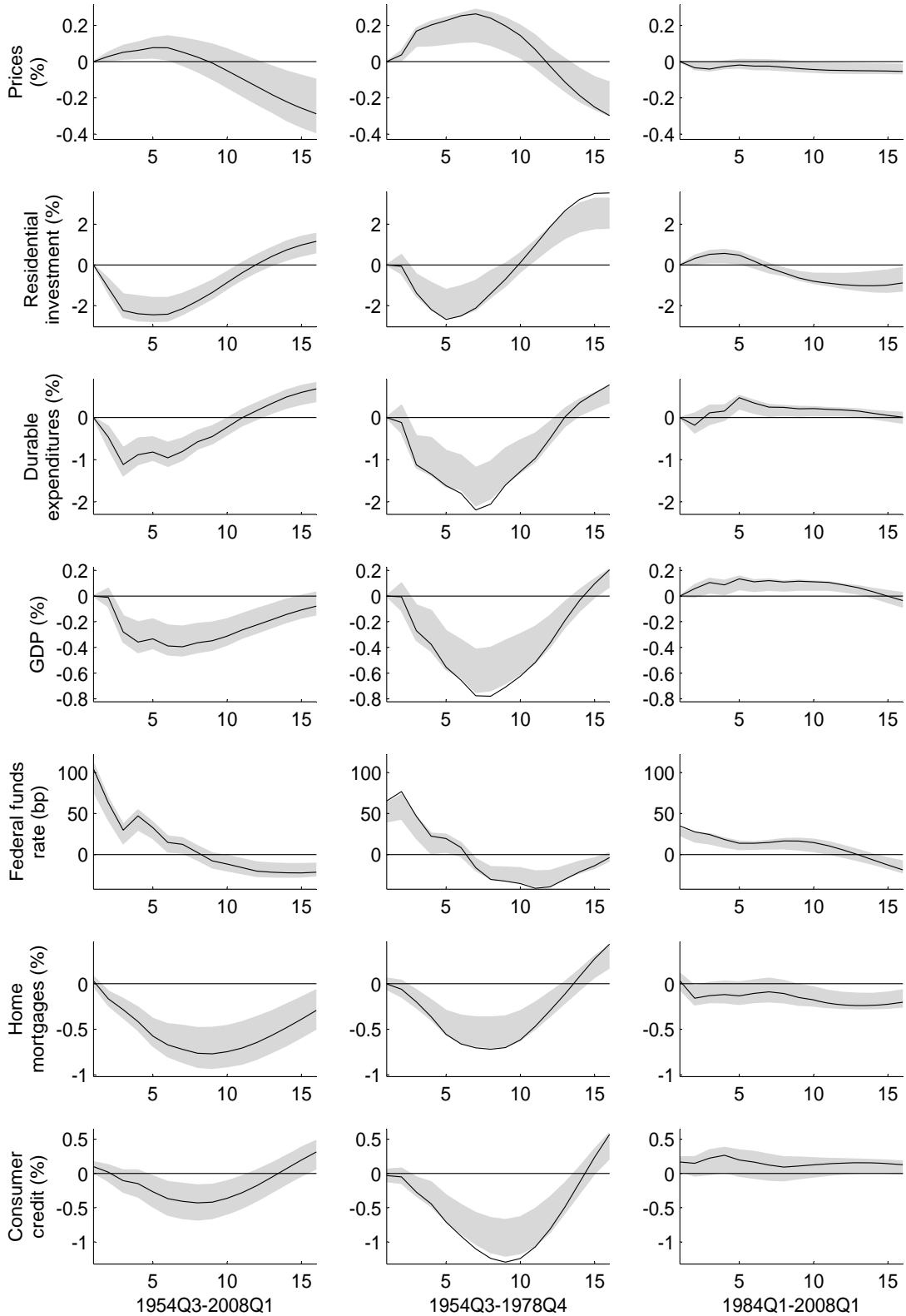
Notes: Responses to a one-standard-deviation shock in the federal funds rate for the second subsample. The IRFs are generated by a VAR with the same specification as the one used in the main text, except that an index for house prices is included.

Figure 21: IRFs following a monetary tightening; two instead of four lags



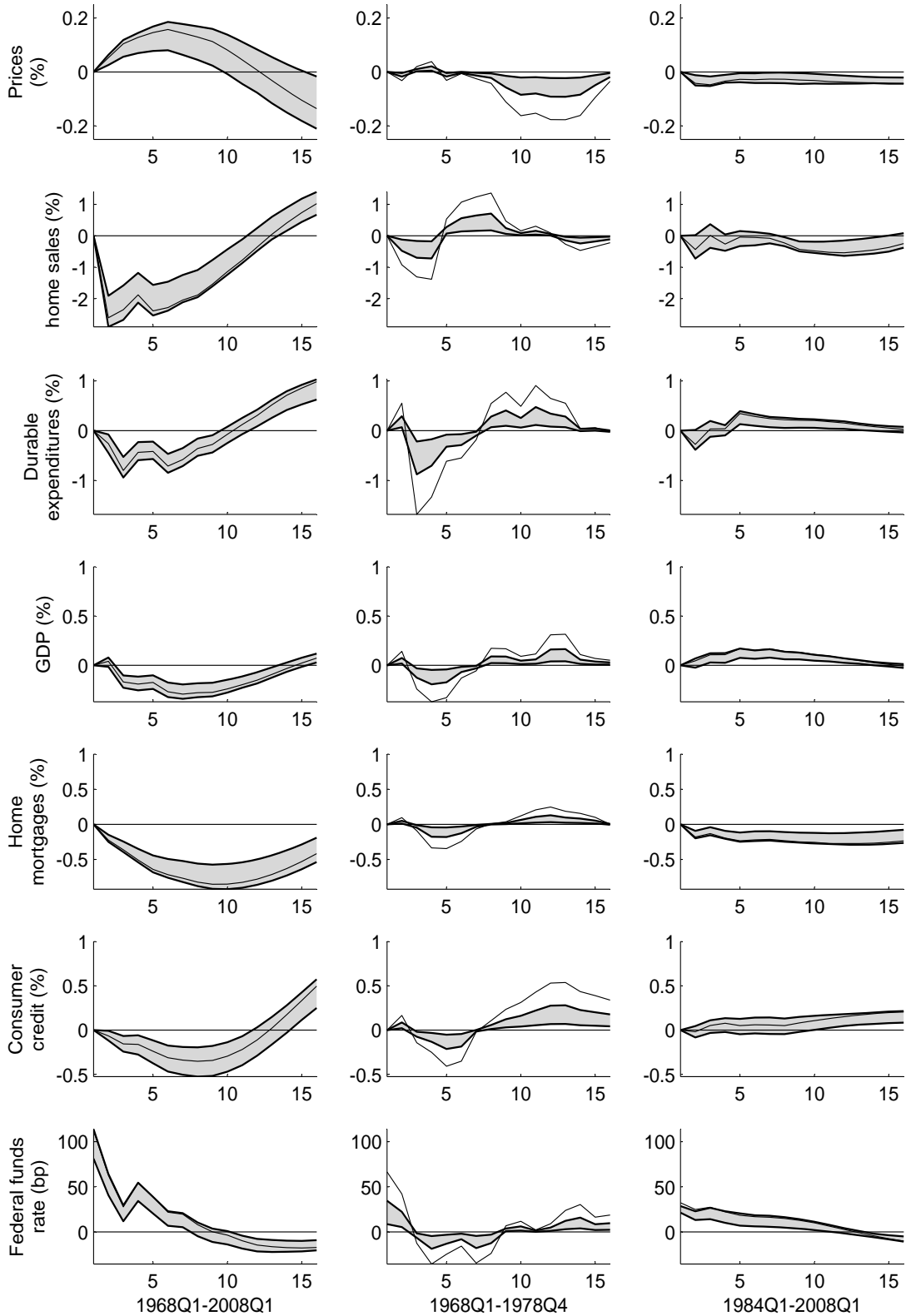
Notes: Responses to a one-standard-deviation shock in the federal funds rate. The IRFs are generated by a VAR with the same specification as the one used in the main text, except that two instead of four lags are used as explanatory variables.

Figure 22: IRFs following a monetary tightening; different orderings



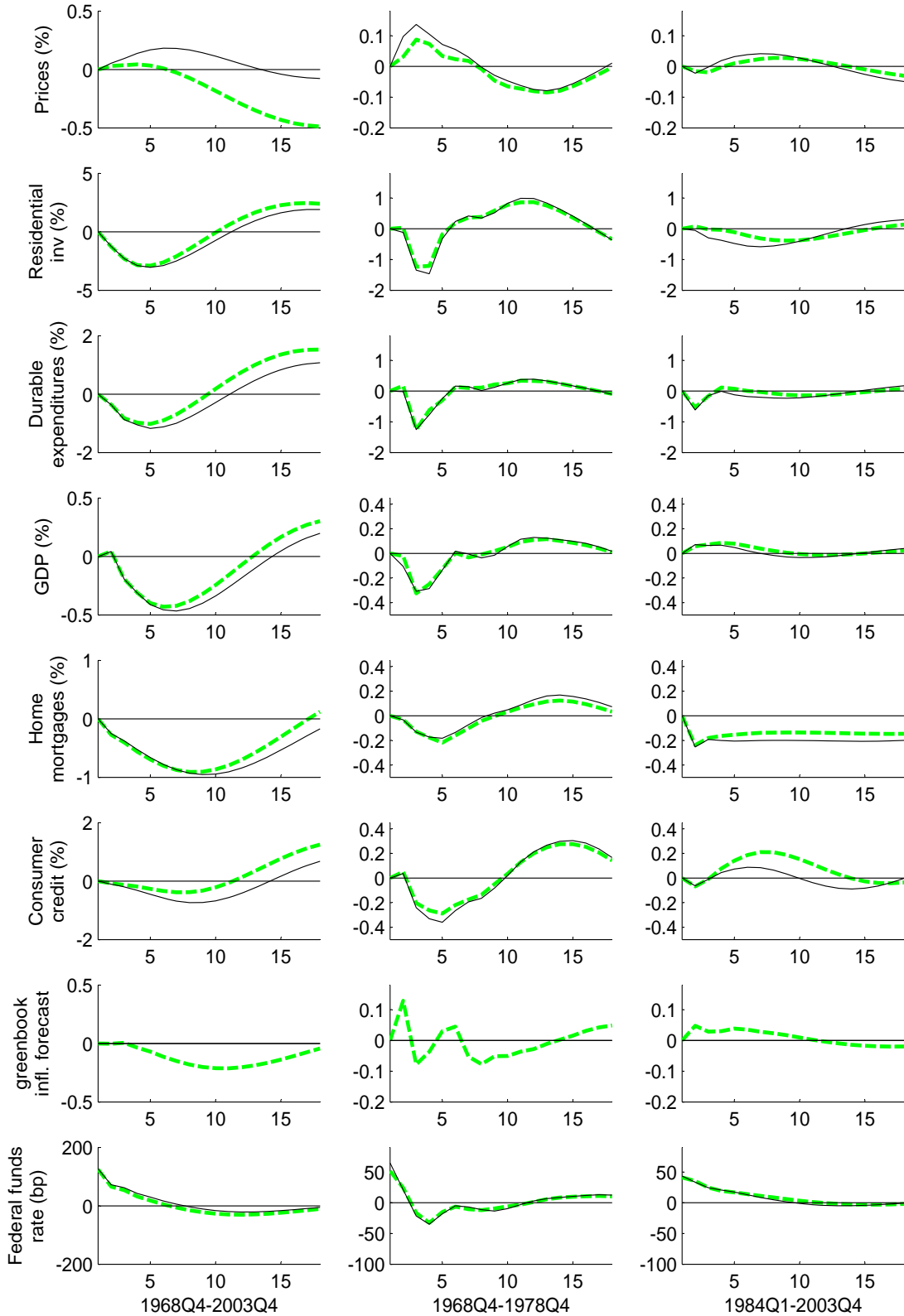
Notes: Responses to a one-standard-deviation shock in the federal funds rate. The IRFs are generated by a VAR with the same specification as the one used in the main text, except that consumer loans can respond to our end-of-quarter policy shock within the quarter.

Figure 23: IRFs following a monetary tightening; with home sales



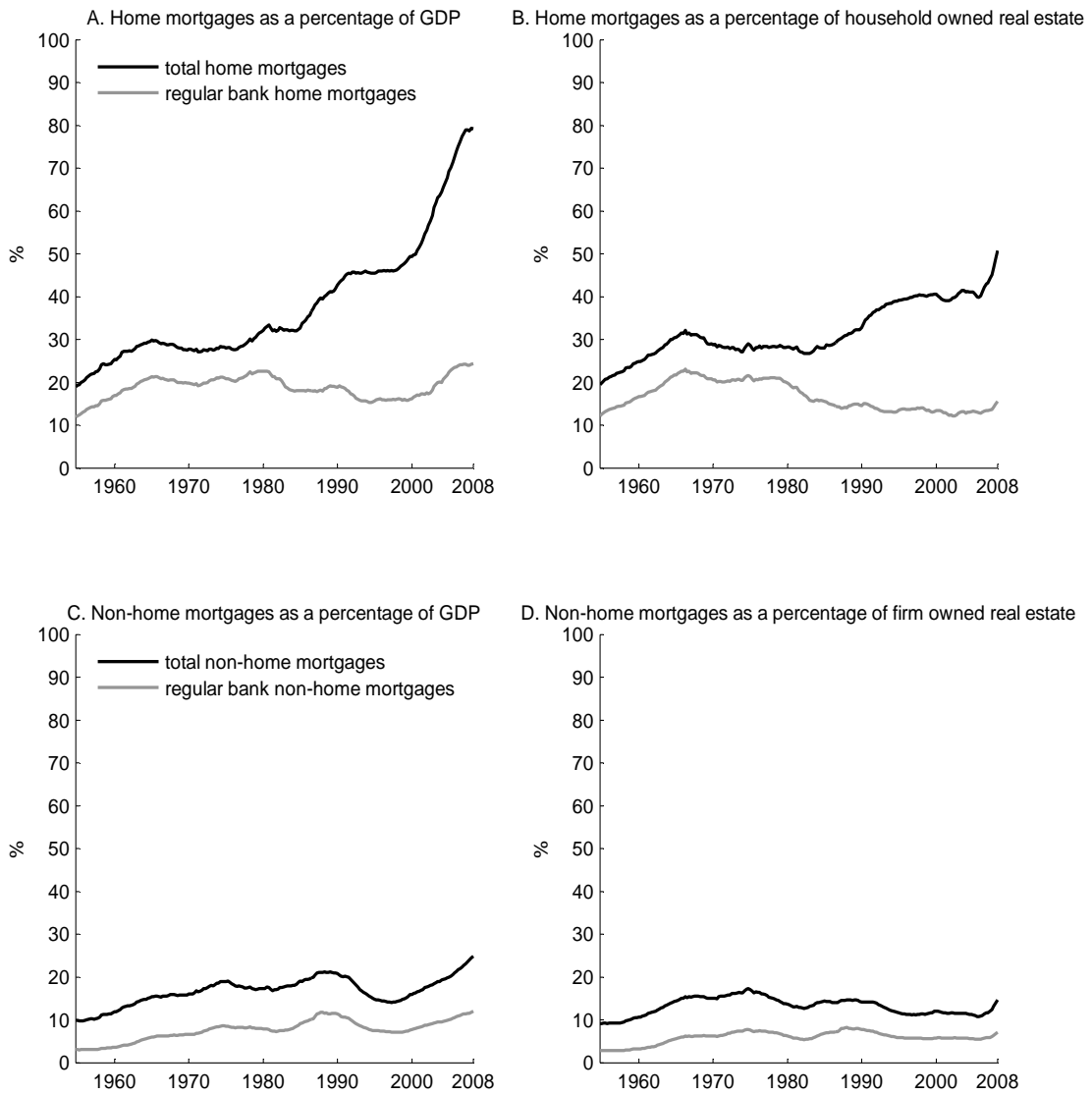
Notes: Responses to a one-standard-deviation shock in the federal funds rate. The IRFs are generated by a VAR with the same specification as the one used in the main text, except that residential investment is replaced by home sales.

Figure 24: IRFs following a monetary tightening; with expected inflation measure



Notes: Responses to a one-standard-deviation shock in the federal funds rate. The IRFs are generated by a VAR with the same specification as the one used in the main text, except that the 2-quarter ahead expected inflation from the Fed Greenbook is added as an explanatory variable.

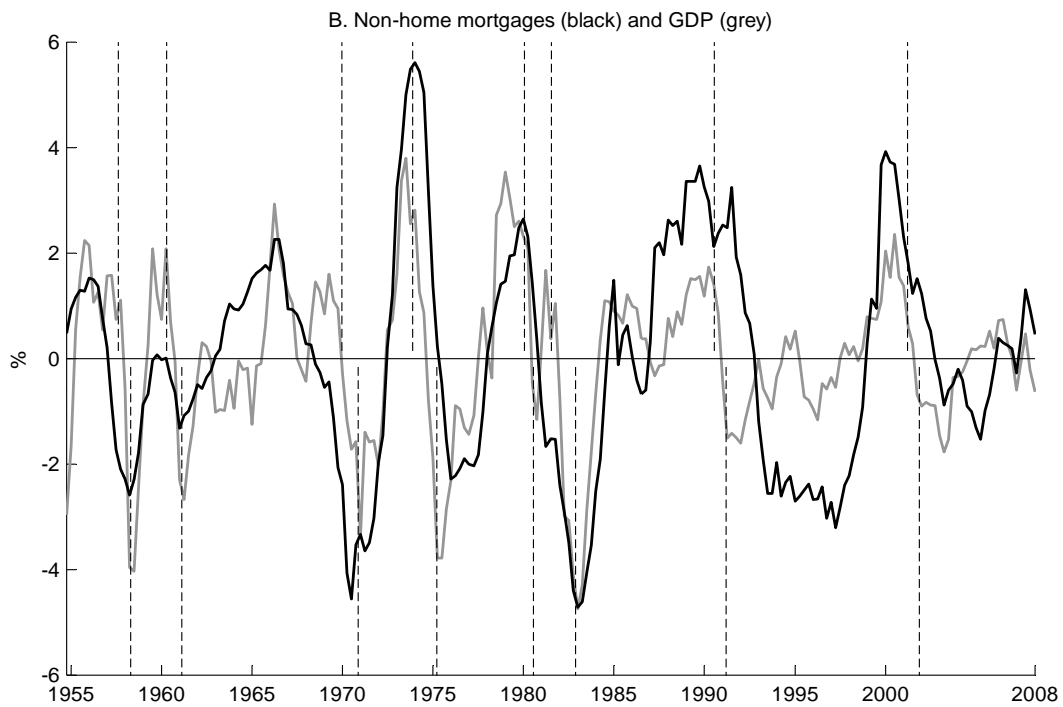
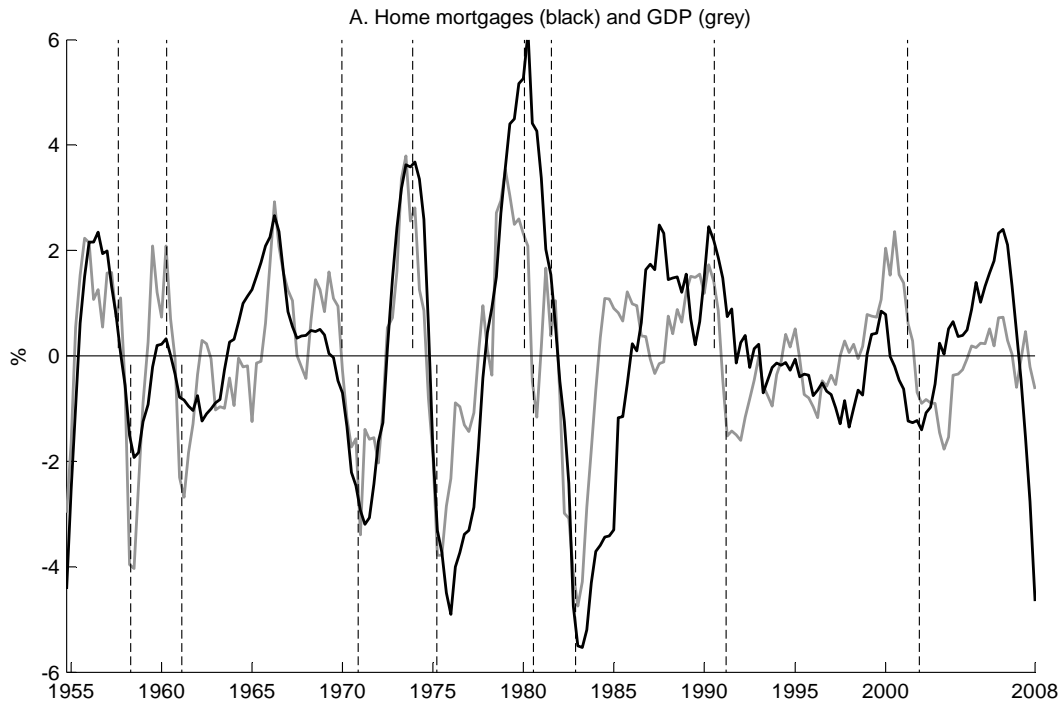
Figure 25: Home and Non-Home mortgages; scaled by GDP or value underlying asset



Notes: "Regular" bank mortgages are those directly held on the banks' balance sheets and not in the form of asset-backed securities and "total" bank mortgages include both. In the two panels on the right, the mortgage series is scaled with the market value of the associated real estate variable.

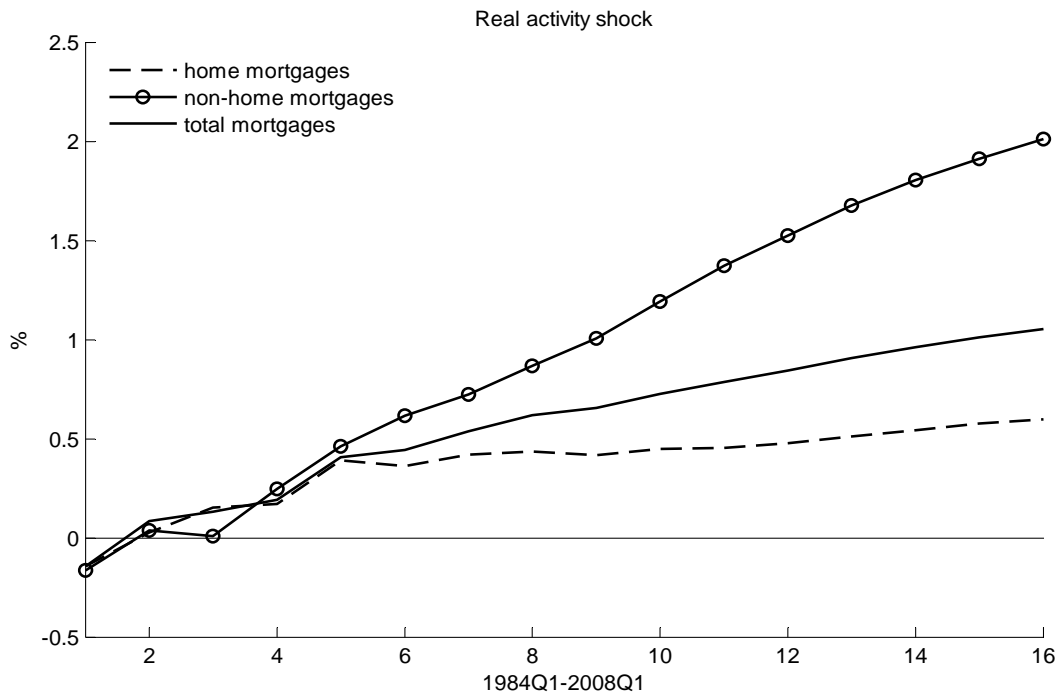
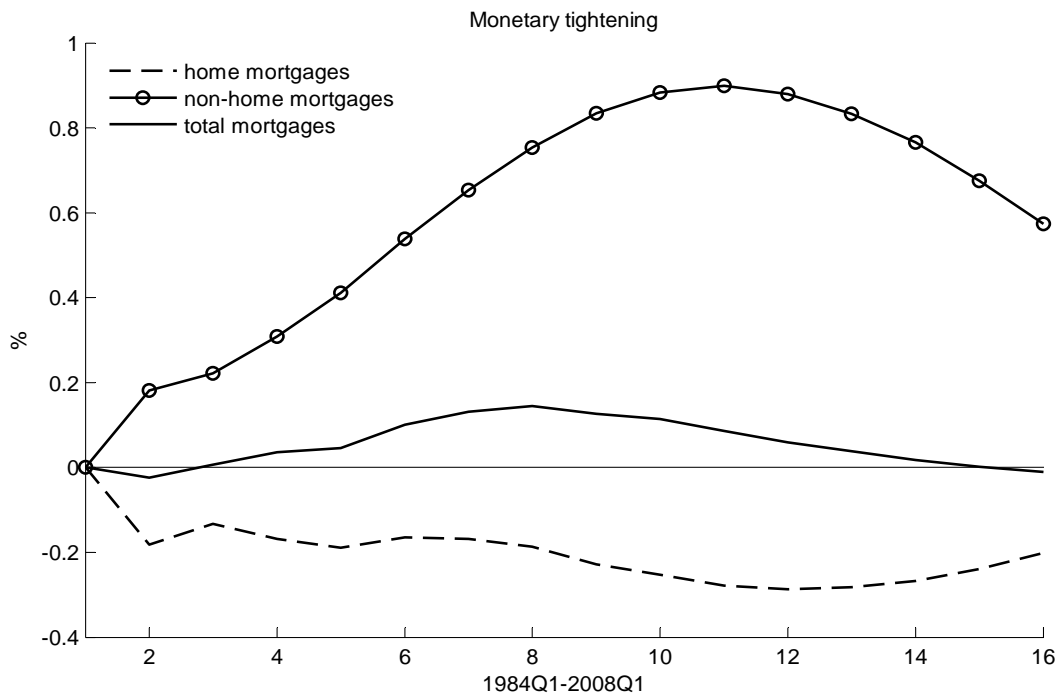


Figure 26: Cyclical components of home and non-home mortgages



Notes: These two panels plot the HP-filtered residual of the indicated component and the HP-filtered residual of GDP. The vertical lines above (below) the x-axis correspond to NBER peaks (troughs).

Figure 27: IRFs for home, non-home, and total mortgages



Notes: IRFs for the indicated shocks.