Università degli Studi di Ferrara

DIPARTIMENTO DI ECONOMIA, ISTITUZIONI, TERRITORIO

Corso Ercole I D'Este n.44, 44100 Ferrara

Quaderni del Dipartimento

n.17/2000

November 2000

Financial Liberalisation and the Sensitivity of House Prices to Monetary Policy: Theory and Evidence

Matteo Iacoviello and Raoul Minetti

November 2000

Financial Liberalisation and the Sensitivity of House Prices to Monetary Policy: Theory and Evidence[†]

by Matteo Iacoviello[‡] and Raoul Minetti[§]

Summary

House prices, monetary policy, financial liberalisation. (J.E.L. C32, E32, E52, R21)

This paper analyses the impact that a process of financial liberalisation can have on the link between monetary policy and house prices. In the first part of the paper we present a simple theoretical model of a small open economy subject to credit constraints. The model shows that the higher is the degree of financial liberalisation of the economy, the stronger is the impact of monetary policy shocks on house prices. In the second part of the paper we use a VAR approach to study the role of monetary policy in house price fluctuations in three European countries (Finland, Sweden and UK) characterised by major episodes of financial liberalisation over the last twenty years. Our findings are in general consistent with the idea that the response of house prices to monetary shocks is bigger and more persistent in periods characterised by more liberalised financial markets.

[†] We thank Nobuhiro Kiyotaki, Andrea Caggese and Vicente Cunat for comments and suggestions on an earlier version of this draft. Any errors are our own.
[‡] Universita' di Bologna, CEP and LSE. Email: M.Iacoviello@lse.ac.uk
[§] FMG and LSE. Email: R.Minetti@lse.ac.uk

1. Introduction

In the last three decades or so, many industrialised countries have experienced wide changes in house prices. It is generally felt that monetary policy conditions have been an important factor behind house price inflation and deflation. It is also agreed that the process of financial liberalisation can have played a direct role in these fluctuations (IMF, 2000) but little is known, instead, on the possible indirect role that financial liberalisation could have had modifying the sensitivity of house prices to monetary policy actions. This paper takes a preliminary step in investigating this issue. In the first part of the paper we present a simple theoretical model of a small open economy subject to credit constraints. With the help of numerical calibrations of the model, we analyse the impact of interest rate shocks on house prices in regimes characterised by different levels of financial liberalisation. The results show that the higher is the degree of financial liberalisation of the economy, the higher is the impact of monetary policy shocks on house prices.

In the second part of the paper we analyse by means of vector autoregressions (VAR) how house prices respond to monetary policy shocks in three European economies (Finland, Sweden and UK). We test whether in these economies the sensitivity of house prices to monetary policy has increased over time as a result of the process of financial deregulation. The results of this empirical section reveal that the magnitude of the response of house prices to monetary shocks is higher and the persistence longer in periods characterised by more liberalised financial markets.

The paper is organised as follows: section 2 presents the model and the numerical simulations. Section 3 describes the econometric methodology, the data and the econometric results. Section 4 concludes.

2. A simple theoretical model

2.1. Framework

The (oversimplified) framework is the standard representative agent model. The economy is small and open to the rest of the world, facing the risk of exogenous shocks to the (stochastic) real world interest rate. The representative agent in this economy enjoys utility from consumption of two different goods, a consumption non-durable good, whose price is the numeraire, and a durable good, house henceforth, whose characteristic is to yield utility services forever. Only the non-durable good is internationally tradable. For simplicity, we assume in addition that the stock of houses is fixed and does not depreciate, which seems plausible given the short run focus of our analysis.

As a non-standard feature of the model, we introduce a credit constraint on the total amount of borrowing from abroad: the outstanding foreign debt of the representative agent in the domestic economy must not exceed a fraction j of the total value of the housing stock. The parameter j will be shown to be a key element of the model, in that it can easily be thought as a proxy for the degree of financial liberalisation of the economy.

We will first start from analysing the behaviour of the constrained economy. Then we introduce standard assumptions that enable us to construct a rational expectations steady state equilibrium in which the economy is on the edge between a credit-constrained regime and an unconstrained one. We then compare the effects of negative monetary policy shocks for different degrees of financial liberalisation, i.e. for different values of the parameter j. It turns out that interest rate shocks have more powerful effects on real house prices the higher the value of j.

This complements the result that others (Miles, 1992) have shown in a different framework, according to which financial liberalisation can *directly* lead to fluctuations in house prices.

2.2. The representative agent problem: the general case

The representative agent maximises his expected utility defined over random sequences of consumption (C_t) and houses (H_t):

$$U = E_0\left(\sum_{t=0}^{\infty} b^t\{u(C_t, H_t)\}\right)$$

E_0 denotes the expectation based on the information set available at time *0*; b is the discount rate. The economy is subject to the following constraints:

$$B_t = R_t B_{t-1} + AF(K_{t-1}) - C_t - P_t(H_t - H_{t-1}) - (K_t - (1-d)K_{t-1}) \quad (1)$$

$$H = given, H_t = H_{t-1} \quad (2)$$

$$j_t E_t(P_{t+1})H_t + B_t \geq 0 \quad (3)$$

where, with standard notation, the first constraint describes the evolution of the level of net foreign bonds *B*, *R* is the gross international real rate of return, *AF(K)* describes the domestic production technology as a function of the capital stock *K*, *P* is the relative price of housing *H*, and the last term in brackets is the accumulation equation for the capital stock *K*. The second constraint assumes that the stock of houses is fixed and does not depreciate over time; finally, the third constraint states that the level of foreign debt must not exceed a fraction j of the next period expected value of the housing stock.

Eliminating *C* in the utility function, the first order conditions for this problem are given (respectively for *B*, *H* and *K*) by:

$$U_{c,t} - l_t = bU_{c,t+1}R_{t+1} \quad (4)$$

$$U_{c,t}P_t - U_{h,t} - \lambda_t \jmath_t P_{t+1} - bU_{c,t+1}P_{t+1} = 0 \quad (5)$$

$$U_{c,t} - bU_{c,t+1}\left[AF_K(K_t) + 1 - d\right] = 0 \quad (6)$$

where λ denotes the shadow price of the borrowing constraint.

In addition, we have the following equilibrium conditions in the goods and in the capital markets:

$$B_t = R_t B_{t-1} + A_t F(K_{t-1}) - C_t - P_t(H_t - H_{t-1}) - (K_t - (1-d)K_{t-1}) \quad (1)$$

$$H_t = H_{t-1} = H \quad (2)$$

$$\lambda_t(\jmath_t P_{t+1} H_t + B) = 0 \quad (3')$$

The equations (1), (2), (3'), (4), (5) and (6) constitute a dynamic system of 6 equations in the 6 unknowns: *C*, *H*, *K*, *B*, λ, *P*.

2.3. A simple functional specification and the steady state equilibrium

We assume that the utility function has a simple log form $u = \log C + g \log H$ and that the production function is a Cobb-Douglas: $Y = AK_{-1}^{a}$. In this case, the first order conditions (4) to (6) become:

$$1/C_t - \lambda_t = bR_{t+1}/C_{t+1}$$

$$P_t/C_t - g/H_t - \lambda_t \jmath_t P_{t+1} - bP_{t+1}/C_{t+1} = 0$$

$$1/C_t - \left(b/C_{t+1}\right)\cdot\left(aAY_t/K_{t+1} - d\right) = 0$$

In addition, for the special case in which *R=1/b*, we can describe the deterministic steady state of the model as given by the following equations:

$$\lambda = 0$$

$$g/H = P(1-b)/C$$

$$aY/K + 1 - d = R$$

$$C = Y + B(R-1) - dK$$

The first equation states that in steady state the credit constraint is necessarily not binding (λ =0). The second determines the intratemporal choice between the two goods *C* and *H*. The third equation requires the marginal product of capital be equated to the international real rate of return. Finally, the fourth equation says that consumption of the tradable good is constant and equals production minus depreciation minus repayments of outstanding obligations.

As discussed in Correia, Neves and Rebelo (1995), in a real business cycle model of a small open economy the steady state is compatible with any value of net foreign holdings *B*. In order to pin down a meaningful value for *B*, we start from the razor-edge situation in which both terms of the product in (3') are equal to zero: that is, $l = 0$ and $B = - jPH$. In other words, the credit constraint is exactly on the brink between binding and non-binding.

Therefore we can replace (3') with:

$$j_t P_{t+1} H_t + B_t = 0 \qquad (3'')$$

The basic intuition for choosing this steady state is that we can think of an economy that initially starts from a constrained regime and accumulates savings until it comes out of the constrained regime[1], stopping just on the edge between the credit constrained area and the unconstrained one.

---

[1]A technical remark on the steady state equilibrium; We know that that in steady state the following holds:

$C/K = Y/K + (B/K)(1/b - 1) - d = (1/b - 1 + d)/a + (B/K)(1/b - 1) - d$

Using the fact that $Y/K = (1/b - 1 + d)/a$, this implies that once we specify B/K, C/K follows. Moreover, since in steady state the credit constraint is binding, for every value of φ in steady state there is an associated value of B/K. In particular, from $B=-jPH$ and $Cg=PH(1-b)$, we have:

$$j = -\frac{B}{C}\frac{1-b}{g} = \frac{-(B/K)}{(1/b - 1 + d)/a + (B/K)(1/b - 1) - d}\frac{1-b}{g}$$

This implies that for any value of φ, we are not free to choose the ratio B/K when making our simulations. Intuitively this steady state property simply means that higher degrees of financial liberalisation are associated with higher levels of external debt.

2.4. The effects of an interest rate shock

A. A preliminary qualitative assessment

We turn now a numerical analysis of the model. The methods are familiar. We log-linearise around the steady state described above the equilibrium conditions (1) to (6), replacing (3) with (3''), and find the linear decision rules using the method of the undetermined coefficients.

Here we provide some qualitative insights on the effects of an interest rate change. With a slight abuse of notation, time-subscripts under the variables denote from now on percentage deviations from the nonstochastic steady state (for λ we refer to absolute deviations, since we log-linearise around a zero value), whereas we drop variable subscripts whenever we denote steady state values.

Iterating forward the equation (5) for the house price dynamics gives:

$$P_t = C_t + jC\sum_{t=0}^{\infty} b^i l_{t+1} .$$

Doing the same for the consumption Euler equation (4) yields:

$$C_t = -Cl_t - Cl_{t+1} + C_{t+2} + R_{t+2} + R_{t+1} = -C\sum_{i=0}^{\infty} l_{t+i} - \sum_{i=0}^{\infty} R_{t+i} \qquad (7),$$

and therefore, combining the last two equations:

$$P_t = C_t + jC\sum_{i=0}^{\infty} b^i l_{t+i} \cong -\sum_{i=0}^{\infty} R_{t+i} - C\left[\sum_{i=0}^{\infty} l_{t+i}\left(1 - jb^i\right)\right] \qquad (8).$$

Looking at equations above we can easily get the following qualitative insights:

1) The constrained and the unconstrained economy respond differently to the shocks. In particular, looking at the equations (7) and (8), it emerges that, to the extent that j differs from zero, house prices will respond differently from the consumption of the non-durable good when

the economy enters the constrained regime (this case, which implies that $\lambda>0$, happens following interest rate decreases). Conversely, changes in the interest rate that lead the economy out of the constrained region (increases) always lead house prices and consumption to react in the same way, since in that case the multiplier l always equals zero.

2) *For a given initial steady state*, different values of j imply different responses of house prices to changes (reductions) in the interest rate that bring the economy into the constrained regime. This can be inferred from the fact that in (8) j appears to affect explicitly the dynamics of house prices. Yet a clear interpretation can be given only using numerical simulations since the multiplier l is endogenous too.

3) Since different levels of j imply different initial steady states (see footnote 1), and different levels of the steady state ratios *B/K* and *C/K*, the degree of financial liberalisation will affect the dynamic response of house prices also through this channel when the economy enters the constrained regime. This can be observed from equation (8), where the steady state consumption level *C* affects the response of house prices.

Overall, the incidence of financial liberalisation on the link between house prices and interest rates depends on two main factors:

a) A *wealth* factor. The reduction in the interest rate reduces the interest burden on debt, determining an increase in housing demand and consumption demand. This effect is bigger, the bigger the outstanding debt (*B/K*) of the economy. Since financially liberalised economies are able to sustain a higher level of debt in the steady state equilibrium, they benefit more from a reduction in the interest burden. This “income” effect depends on the initial steady state of the economy.

b) A *distortion* factor. This second effect derives from the different degrees of distortion that different degrees of financial liberalisation have on the intratemporal choice between houses and consumption goods. When the economy enters the rationed regime, the size of the increase in the demand for houses will depend inversely on the level of j. Intuitively, when j is high, houses have a stronger role as collateral and, *ceteris paribus*, the demand for houses is bigger. Therefore this distortion effect is likely to increase the sensitivity of house prices to interest rate shocks in financially liberalised economies, working in the same direction of the wealth effect. Of course, this effect is at work only when collateral "matters" i.e. only when the economy enters the constrained regime.

B. Numerical simulations

Figures 1 to 3 show graphically the impulse responses following an interest rate shocks for three economies characterised by different degrees of financial liberalisation.

A reduction in the interest rate determines an increase in the relative price of houses that is higher in economies with a higher degree of financial liberalisation (figure 1 versus figure 2). As already stressed, this behaviour is the result both of a wealth and of a distortion effect. It is worth disentangling their relative importance in the link between financial liberalisation and the sensitivity of house prices to monetary shocks. Figures 2 and 3 compare two economies for which we net out the wealth effect. The device we use is to assume different initial values of the parameter g, the relative weight given to housing in the utility function. g does not affect the dynamics of the system but only the initial steady state. Therefore, in order to start from the same steady state ratios *B/K* and *C/K*, we let different values of g correspond to different values of j according to equation (A) in footnote 1. After neutralising the wealth effect, the reaction of house

prices to a decrease in the interest rate appears stronger (even though less persistent) the higher is the degree of financial liberalisation of the economy. This result appears consistent with the intuition already provided above: when the economy enters the rationed regime, the size of the increase in the demand for houses depends inversely on the level of the required down-payment. Intuitively when j is high, houses have a stronger role as collateral and the demand for houses is bigger. Therefore, the distortion factor appears to work in the same direction of the wealth factor (at least over short horizons).

We have therefore shown that the traditional price channel of monetary policy is stronger in more liberalised economies[2]. Despite its simple structure, the model captures some of the main features of countries affected by recent house price inflation. The Nordic countries for instance (Sweden, Finland and Norway) are all small open economies that experienced financial liberalisation during the Eighties, when they deregulated the internal financial market ("internal financial liberalisation") and opened to foreign capital inflows ("external financial liberalisation").

The analysis has a number of shortcomings, first of all the fact that we identify financial liberalisation only with lower down-payment restrictions. As to the actual lack of money in the framework (actually we identify monetary shocks with interest rate shocks) this is probably less troubling, since in many countries the conduct of monetary policy uses interest rates as instruments.

[2] In addition, the model implies that the effects of an interest rate shock will be partially asymmetric: however, we will not test this prediction.

3. Empirical analysis

3.1. Financial liberalisation in European housing markets

Starting from the second half of the Eighties, a number of European countries underwent a massive process of deregulation of the financial markets, including the housing finance markets[3]. The main steps of this process consisted of the abolition of ceilings on deposits and lending interest rates, relaxation of portfolio restrictions for financial institutions (both on the liability and on the asset side), withdrawal of entry restrictions (also on foreign institutions) and relaxation of quantity restrictions on borrowers (like down-payment requirements). The extent and the pattern of this process differed widely across countries: the Nordic countries and the UK experienced a major structural break in their financial markets. In Sweden ceilings on lending rates and quantitative controls on bank loans were abolished in 1985. In this liberalised and competitive environment banks increased their exposure to the real estate sector both directly and indirectly, through their important share of control in the finance companies active in the housing market. In Finland lending rates were liberalised in 1986, with floating rates allowed on all loans in 1988. In UK the process of liberalisation took place in different steps from 1980 to 1986 culminating in the Building Societies Act in 1986.

We test our hypothesis on the impact of financial liberalisation on the link between monetary policy and house prices. We apply a VAR methodology to three European economies deeply affected by financial deregulation during the Eighties, namely UK, Sweden and Finland. Our claim is that in these countries financial liberalisation would have determined a regime shift

[3] It would be unwise to fully review the literature on this issue here. See IMF (2000) for an overview and references therein.

increasing the effectiveness of monetary policy in the housing market[4], in line with the theoretical model presented in section 2.

A first way of analysing the impact of deregulation on the effectiveness of monetary policy in the housing market is contrasting the impulse responses of real house prices to monetary policy innovations across sub-periods characterised by different degrees of financial liberalisation[5]. The main problem associated with this strategy is that a direct comparison of the stance of monetary policy is made hard by the fact that the shock varies in size, shape and duration across sub-samples. However, we normalise the shocks across countries and subperiods to be equal to one standard deviation in size in each of the subsamples: this procedure has the virtue of neutralising differential effects of monetary policy due to less or more erratic monetary policies across subsamples.

The second strategy we will use is to detect the fraction of the house price variability that can be accounted for by the variability in monetary policy instruments (variance decomposition) in sub-samples characterised by different degrees of regulation.

3.2. Empirical methodology

To gauge whether monetary policy mattered differently for movements in house prices in the two sub-samples, we estimate for each country two four-variable autoregressions (VAR), one before the financial liberalisation episode, the other after, using quarterly data on output, consumer prices, interest rates and house prices. Although it is not possible to determine with precision when the three economies entered the liberalised regime, for all the three countries the

[4] A different but related issue is whether financial liberalisation modified the transmission mechanism of monetary policy, for instance affecting the relative importance of the interest rate channel versus the credit channel. The prevailing view is that the relaxation of financial constraints could have progressively shifted the transmission mechanism from the interest rate channel to the credit channel.

shift from a regulated to a liberalised environment is treated as having occurred in the second half of the eighties. We split the whole sample approximately around that period, allowing for Finland and Sweden some overlapping between the two subperiods in order to preserve degrees of freedom. To check the robustness of our findings, we also tried various slightly different subsamples with no significant changes in the results.

Following Bernanke and Blinder (1992), and most of the subsequent literature on the monetary policy transmission mechanism, we include a three month domestic rate as our monetary policy variable. This variable can easily be considered as the Central Bank's main short run target. Of course, in small economies like Sweden and Finland, this variable is likely to be determined not only by the domestic Central Bank, but also indirectly by the policy of another Central Bank, such as the Bundesbank. This is consistent with our theoretical analysis, that implicitly assumes that the domestic interest rate is tied to a (unspecified) world interest rate. For each country we use two lags - sufficient to induce noiselike residuals - and include the following variables, observed with quarterly frequency: the log of real GDP, annualised consumer price inflation, a short term interest rate and a real house price index (in log) in that order[6]. The ordering reflects the possibility that innovations in the interest rate can affect output and consumer price inflation only with one lag, whereas they can immediately affect house (asset)

[5] An analogous exercise on the differential impact of monetary policy on land prices in Japan (before and after financial liberalisation) is performed by Hoffmaister and Schinasi (1994).

[6] Data sources and subsamples are as follows:

Country	Subsamples	Variables (GDP Y, and inflation DP were taken from the IMF International Financial Statistics)
Finland	78Q4 - 89Q2 87Q2 - 99Q3	HP: Residential Property Prices (source: BIS) R: Money Market Rate (Primark Datastream)
Sweden	72Q1 - 86Q4 87Q1 - 99Q3	HP: House Price Index, average of Primary and Leisure Homes (Statistics Sweden) R: 3 months Money Market Rate (Datastream)
UK	74Q1 - 86Q2 86Q3 - 99Q4	HP: Nationwide East Anglia House Price Index (Datastream) R: Treasury Bill Rate (Datastream)

prices. It is also consistent with our theoretical model, in which output takes one period to be produced whereas real house prices are a jump variable.

Since it is possible to find evidence of cointegration in some of the samples, we do not difference the variables and estimate in each case an unrestricted VAR. The results are shown on figure 5, alongside with 90% bootstrapped confidence bands (obtained with 500 replications).

Real house prices significantly decrease in virtually all the three countries following a monetary contraction. In addition, the results support the thesis that during the period of financial liberalisation monetary policy had more powerful effects on the relative price of houses. Sweden and UK feature the clearest and most supportive results. Observing figure 4, it emerges that not only after the half of the Eighties the response of house prices was much more pronounced for a given innovation in the interest rate but also that the dynamics in house prices exhibited more persistence. In Sweden, the impact of a monetary policy shock on house prices is weak in the first sub-sample while a comparable and smaller negative shock in the second sub-sample leads to a stronger decrease in real house prices. Analogous considerations apply for UK, where monetary policy appears to affect house prices more in the second subsample. In particular a smaller and less persistent shock leads to a fall in real house prices twice as big as in the first subsample. The results for Finland look less consistent with our thesis. While over the short run it appears that house prices react to monetary shocks more in the second subperiod, the situation appears reversed after about two years.

The results from variance decomposition (figure 5) are in line with the findings from the impulse response analysis. The share of the variation in real house prices accounted for by the monetary policy shock measure is larger at all horizons in the second period both in Sweden and in UK. The results are instead inconclusive as far as Finland is concerned, with monetary policy

mattering more at short horizons (less than two years) in the second period, and less at longer horizons[7].

4. Conclusions

In this paper we have analysed and tested the impact of financial liberalisation on the link between monetary policy and house prices. The results suggest that financial liberalisation could have had a major role not only *directly* spurring house prices but also *indirectly* increasing the policy sensitivity of the housing market. The normative implications of the analysis are relevant. Just to mention one, the intensity of the process of financial liberalisation has been strongly asymmetric across European countries. Most of these countries (including Finland and in perspective also Sweden and UK) are now characterised by a centralised conduct of monetary policy. At the same time, given the importance of housing wealth in households and businesses portfolios, housing markets play a key role in the transmission of monetary policy. In the presence of significant differences in the degree of regulation of the housing finance markets, therefore, the effects of monetary policy shocks could differ widely across countries, even abstracting from further considerations like different housing tenure patterns or transaction costs. As an obvious corollary, a further convergence of the regulatory framework could clearly make the conduct of monetary policy easier and more effective in the Euro area.

[7] Even though the analysis has been conducted entirely at a within country level it is also interesting to note however that, for substantially comparable monetary shocks, the United Kingdom, i.e. the country with the highest loan-to-value ratios, experiences the biggest house price response to (normalised by the same increase in the interest rate) monetary shocks. However, this cross-country comparison cannot be stretched too far because many other features could explain this higher sensitivity (lower transaction costs, a larger owner-occupied sector, a large proportion of variable-interest mortgage loans).

References

Bernanke, B., and A.Blinder (1992), "The federal funds rate and the channels of monetary transmission", *American Economic Review*, 82, 4, 901-921.

Bernanke, B., M.Gertler (1995), "Inside the Black Box: The Credit Channel of Monetary Transmission", *Journal of Economic Perspectives*, 9, 4, 27-48.

Borio, V., N. Kennedy and S. D. Prowse (1994), "Exploring aggregate asset price fluctuations across countries: measurement, determinants and monetary policy implications", BIS Economic Papers, No. 40.

Correia, I., J.Teles and S.Rebelo (1995), "Business Cycles in a small open economy", *European Economic Review*, 39, 1089-1113.

Hoffmaister, A., and G.J.Schinasi (1994), "Asset Prices, Financial Liberalization, and the Process of Inflation in Japan", IMF Working Paper n.153.

International Monetary Fund (2000), World Economic Outlook: Asset Prices and the Business Cycle, May.

Miles, D. (1992), "Housing Markets, consumption and financial liberalisation in the major economies", *European Economic Review*, 36, 5, 1093- 1127.

Figure 1: Theoretical responses to 1% fall in R (ϕ=.47, B/K=-1.2, α=.4, δ=.025, γ=.5, shock autocorrelation=.7)

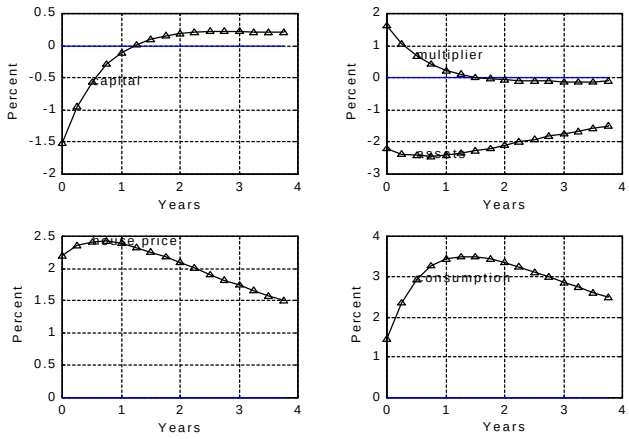


Figure 2: Impulse responses to 1% fall in R (ϕ=.95, B/K=-2, α=.4, δ=.025, γ=.5, shock autocorrelation=.7)

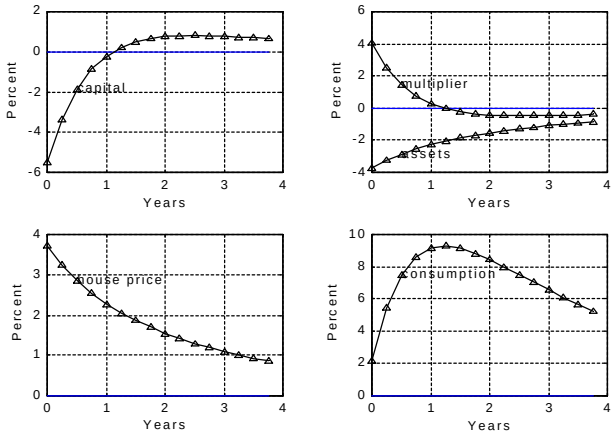


Figure 3: Impulse responses to 1% fall in the R (ϕ=.47, B/K=-2, α=.4, δ=.025, γ=1, shock autocorrelation=.7)

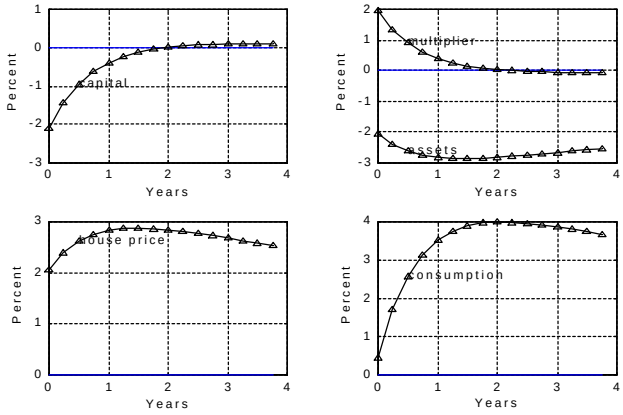
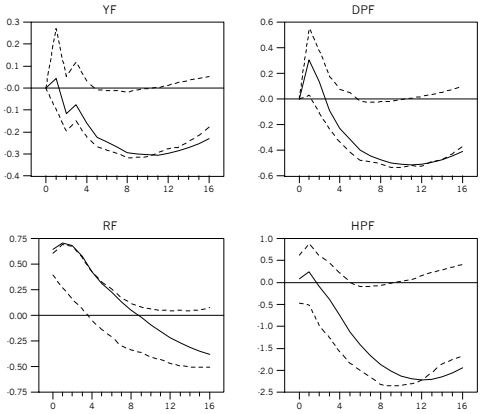
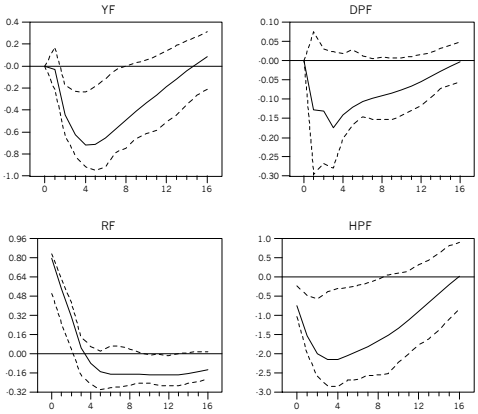


Figure 4: Impulse responses from VAR to a negative monetary shock (90% dashed bands) in the periods shown. Y refers to GDP, DP to annualised inflation, R to interest rate and HP to real house prices. Vertical axes measure percentage changes.

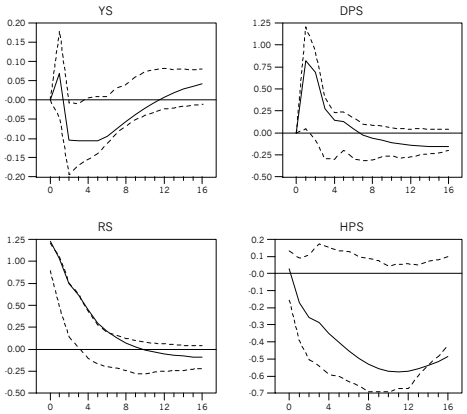
Finland 78:3 - 89:1



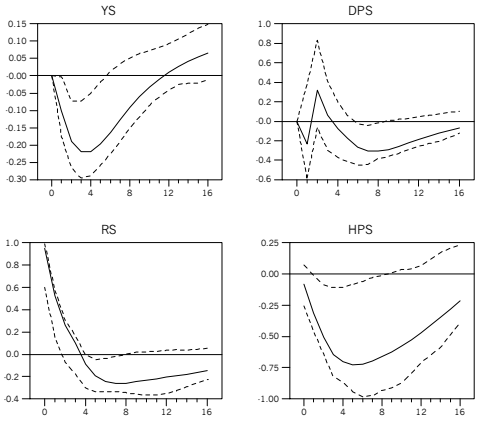
Finland 87:2 - 99:3



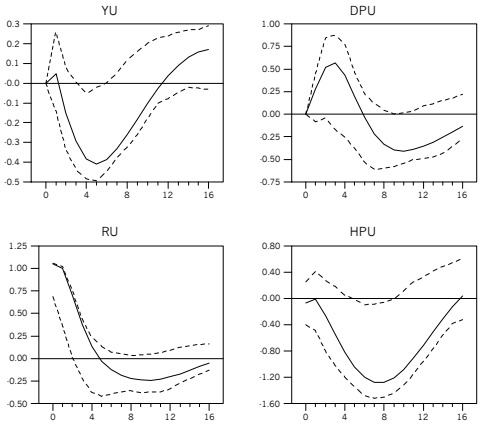
Sweden 72:4 - 87:2



Sweden 85:4 - 98:4



UK 74:1 - 86:2



UK 86:3 - 99:4

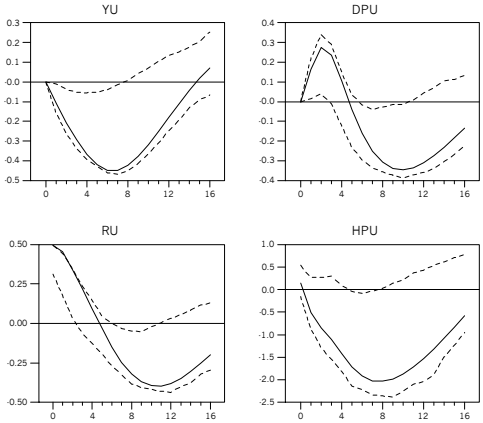


Figure 5: Percent of the *k* ahead error forecast error variance of real house prices due to monetary shocks before (B) and after (A) financial liberalisation respectively in Finland (F), Sweden (S) and UK (U).