



Seðlabanki Íslands

QMM

Nýtt ársfjórðungslegt þjóðhagslíkan Seðlabanka Íslands

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Málstofa í Seðlabanka Íslands

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Inngangur



- Meðganga
 - Verið í smíðum meira eða minna frá 2001
 - Mikill tími farið í uppbyggingu á ársfjórðungslegum gagnagrunni
- Fyrirmyndir
 - Meginfyrirmyndin er MTMM-líkan Englandsbanka
 - Fyrirmyndir einnig sóttar í BASMOD-líkan Riksbank, AQM-líkan Seðlabanka Austurríkis, MEP-líkan Seðlabanka Chíle og MM-líkan ástralska fjármálaráðuneytisins

Gagnagrunnur



- Fjöldi stærða: 147
 - Innri hegðunarstærðir: 28
 - Þar af metnar hegðunarjöfnur: 20
 - Tæknisambönd: 24
 - Skilgreiningar: 28
 - Bókhaldssambönd: 26
 - Ytri stærðir: 41
- Ársfjórðungsleg gögn
 - Frá 1970Q1: 60 raðir (40% af heild)
 - Frá 1980Q1 og fyrr: 93 raðir (63% af heild)
 - Frá 1990Q1 og fyrr: 145 raðir (99% af heild)
 - Frá 1994Q1 og fyrr: allur grunnur



Yfirlit yfir uppbyggingu QMM

Uppbygging QMM



- QMM er í meginatriðum tölfræðilega metið villuleiðréttingarlíkan (ECM)
 - Form, skýristærðir og eiginleikar einstaka jöfnu ráðast þó ekki eingöngu af tölfræðilegum eiginleikum heldur af samhengi við líkanið í heild og eiginleika þess
- QMM er tiltölulega einfalt eins-geira líkan af íslenska hagkerfinu
 - Mjög “aggregerað” en nægilega ítarlegt til að lýsa meginþáttum hagkerfisins
 - Nægilega einfalt til að hægt sé að halda utan um líkanið og gagnagrunn þess og að hafa yfirsýn yfir hagfræðilega skammtíma- og langtímaeiginleika líkansins
 - Á móti kemur að upplýsingar um ýmsa undirþætti tapast
 - Fyrir Seðlabankann skiptir hins vegar mestu máli að líkanið lýsi meginmiðlunarleiðum peningastefnunnar í samræmi við nútímaþekkingu og niðurstöður rannsókna

Einstakir hlutar QMM



- Fjármálakerfi

- Vextir og eignaverð

- Stýrivextir, langtímanafnvextir, verðtryggðir vextir og raunkostnaður fjármagns
 - Gengi: Nafngengisvísitala, US\$ og raungengi
 - Hlutabréfaverð

- Peningamagn og auður

- Hreinn auður heimila: Fjármagnsauður, húsnæðisauður og skuldir
 - Peningaeftirspurn

Einstakir hlutar QMM



- Eftirspurn og framleiðsla
 - Einkaneysla
 - Samneysla
 - Fjárfesting
 - Atvinnuvegir, húsnæði, hið opinbera, fjármagnsstofnar og birgðabreytingar
 - Utanríkisviðskipti
 - Útflutningur utan stóriðju og sjávarafurða, stóriðja og sjávarafurðir
 - Innflutningur
 - Viðskiptajöfnuður og erlend staða
 - Framleiðslugeta og -spenna

Einstakir hlutar QMM



- Vinnumarkaður
 - Laun og launakostnaður á framleidda einingu
 - Atvinnuleysi og atvinnuþátttaka
 - Atvinna og framleiðni vinnuafsisins
- Verðhluti
 - Vísitala neysluverðs
 - Verðvísitölur ráðstöfunarhluta og landsframleiðslu
 - Byggingarvísitala og húsnæðisverð
 - Verðbólguvæntingar

Einstakir hlutar QMM



- Fjármál hins opinbera
 - Skatttekjur
 - Tekjuskattar heimila og fyrirtækja og útgjaldaskattar
 - Útgjöld
 - Niðurgreiðslur, styrkir og vaxtagreiðslur
 - Afkoma hins opinbera
- Ráðstöfunartekjur heimila
 - Atvinnutekjur, fjármagnstekjur og ráðstöfunartekjur



Lýsing á einstaka jöfnum QMM

- Taylor-regla

$$RS_t = \lambda_{rs}RS_{t-1} + (1 - \lambda_{rs}) [(\rho_{rs} + IT_t) + \beta_{rs}(INF_t - IT_t) + \phi_{rs}GAPAV_t]$$

RS Short-term interest rate (4.1).

IT Central Bank of Iceland 2.5% inflation target (exogenous).

INF Four-quarter CPI inflation rate (7.15).

GAPAV Annual average of output gap (5.44).

- Orphanides-regla

$$RS_t = \lambda_{rs}RS_{t-1} + (1 - \lambda_{rs}) [(\rho_{rs} + IT_t) + \beta_{rs}(INF_t - IT_t) + \phi_{rs}(\Delta_4gdp_t - \Delta_4gdpt_t)]$$

RS Short-term interest rate (4.1).

IT Central Bank of Iceland 2.5% inflation target (exogenous).

INF Four-quarter CPI inflation rate (7.15).

GDP GDP (5.39).

GDPT Potential output (5.42).

$$\rho_{rs} = 3.0\%$$

$$\beta_{rs} = 1.5$$

$$\phi_{rs} = 0.5$$

$$\lambda_{rs} = 0.5$$



Aðrir vextir

- Langtímanafnvextir

$$RL_t = 0.00029 + 0.861RL_{t-1} + 0.665RS_t + (1 - 0.861 - 0.665)RS_{t-1}$$

(0.3) (12.9) (4.1)

Adjusted R^2	0.866
Equation standard error	0.49%
Dynamic homogeneity (F -test)	5.32 [0.03]
LM test for serial correlation (F -test)	1.08 [0.31]
Normality test (χ^2 -test)	9.16 [0.01]
White test for heteroscedasticity (F -test)	2.56 [0.04]
Sample period	1996:Q1-2004:Q4 ($T = 36$)

- Verðtryggðir langtímavextir

$$RLV_t = (RL_t - INFE_t) - PRISK_t$$

- RLV Long-term indexed interest rate (4.4).
- RL Long-term interest rate (4.3).
- $INFE$ Inflation expectations (7.16).
- $PRISK$ Inflation risk premium (exogenous).

Gengisvísitala



- UIP-samband

$$eer_t = feer_t - \log RD_t$$

$$RD_t = \left(\frac{(1 + RS_t/4)}{(1 + WRS_t/4)(1 + RISK_t/4)} \right)$$

- PPP-villuleiðréttingarsamband

$$\Delta eer_t = \underset{(2.6)}{0.021} + \underset{(3.5)}{0.386} rex_{t-4}$$

- Gengisjafnan

$$eer_t = \omega_e(feer_t - \log RD_t) + (1 - \omega_e)(0.021 + eer_{t-1} + 0.386rex_{t-4})$$

EER Exchange rate index of foreign currency (4.6).

FEER Expected exchange rate index (4.9).

RD Short-term interest rate differential (4.11).

REX Real exchange rate (4.15).

$$\omega_e = 0.75$$

$$feer_t = eer_{t-1}$$



Einkaneysla – matsjafna

$$\begin{aligned}\Delta c_t = & -0.038 - 0.050Q1 - 0.040Q2 - 0.059Q3 + 0.054D031 \\ & \quad (2.8) \quad (3.1) \quad (2.5) \quad (4.0) \quad (3.0) \\ & +0.615\Delta c_{t-4} + 0.290\Delta rhpi_t - 1.579\Delta UR_t \\ & \quad (6.5) \quad (2.7) \quad (2.7) \\ & -0.134[c - 0.794rhpi - 0.206(wel - pc) + 1.458RLV]_{t-1} \\ & \quad (2.9)\end{aligned}$$

Adjusted R^2	0.957
Equation standard error	1.63%
Long-run restrictions (F -test)	2.70 [0.11]
LM test for serial correlation (F -test)	0.08 [0.77]
Normality test (χ^2 -test)	2.11 [0.35]
White test for heteroscedasticity (F -test)	2.10 [0.04]
Sample period	1992:Q1-2004:Q4 ($T = 52$)

- C Private consumption (5.2).
 $RHPI$ Real household post-tax income (9.6).
 WEL Household sector wealth (4.17).
 PC Private consumption deflator (7.5).
 RLV Long-term indexed interest rate (4.4).
 UR Unemployment rate (6.5).
 $Q1-Q3$ Centered seasonal dummies.
 $D031$ Dummy variable: 1 2003:Q1 and zero elsewhere.

Einkaneysla – eiginleikar jöfnu

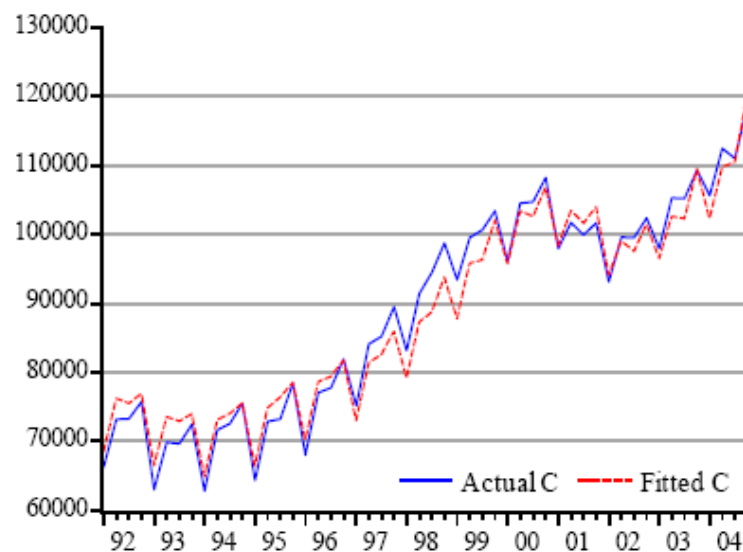
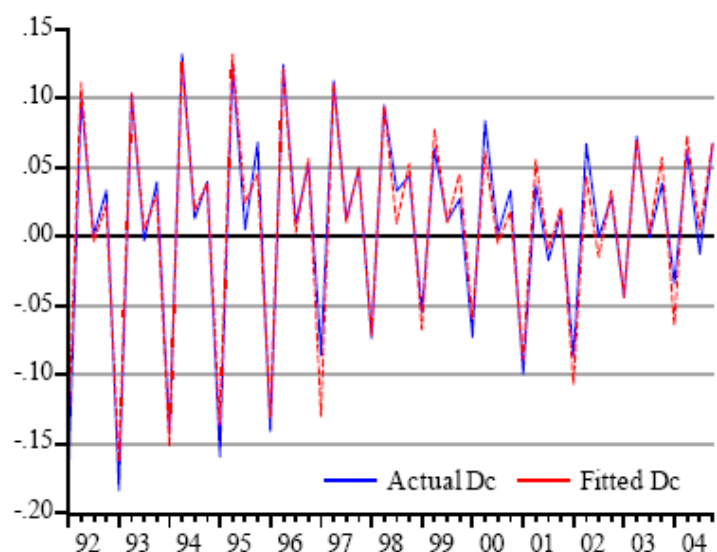


Table 5.1. Responses of c to a 1% increase in RHS variables

Quarters	$rhpi$	$wel - pc$	UR	RLV
Simultaneous	0.29	0.00	-1.58	0.00
Four quarters ahead	0.69	0.09	-1.86	-0.64
Eight quarters ahead	0.95	0.19	-1.30	-1.31
Long run	0.79	0.21	0.00	-1.46
50% of long-run effect	Overshoots	Overshoots	-	Overshoots
90% of long-run effect	Overshoots	Overshoots	-	Overshoots

Steady state solution:

$$(c - rhpi) = const + 0.206(wel - pc - rhpi) - 1.458RLV$$

Atvinnuvegafjárfesting – matsjafna



$$\begin{aligned}\Delta ibreg_t = & \underbrace{-1.910}_{(4.6)} - \underbrace{0.103D9395}_{(3.6)} + \underbrace{0.235D981}_{(3.6)} + \underbrace{0.070D9801}_{(2.5)} \\ & - \underbrace{0.273D021}_{(4.4)} + \underbrace{0.044Q1}_{(1.9)} + \underbrace{0.072Q2}_{(2.9)} + \underbrace{0.068Q3}_{(2.3)} \\ & + \underbrace{0.211\Delta ibreg_{t-3}}_{(2.5)} + \underbrace{0.727\Delta gdp_{t-2}}_{(3.1)} - \underbrace{0.326[ibreg - gdp + rcc]_{t-1}}_{(4.6)}\end{aligned}$$

Adjusted R^2	0.697
Equation standard error	5.63%
Long-run restrictions (F -test)	2.78 [0.08]
LM test for serial correlation (F -test)	0.50 [0.48]
Normality test (χ^2 -test)	5.14 [0.08]
White test for heteroscedasticity (F -test)	0.89 [0.11]
Sample period	1992:Q1-2004:Q4 ($T = 52$)

IBREG Business investment excluding the aluminium sector (5.10).

GDP GDP (5.39).

RCC Real cost of capital (4.5).

D9395 Dummy variable: 1 1993:Q1-1995:Q4 and zero elsewhere.

D981 Dummy variable: 1 1998:Q1 and zero elsewhere.

D9801 Dummy variable: 1 1998:Q1-2001:Q4 and zero elsewhere.

D021 Dummy variable: 1 2002:Q1 and zero elsewhere.

Q1-Q3 Centered seasonal dummies.

Atvinnuvegafjárfesting – eiginleikar jöfnu

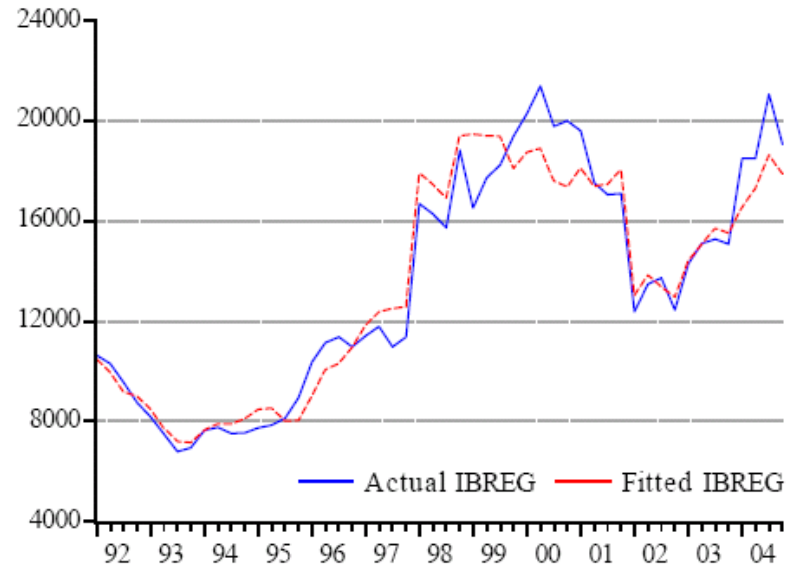
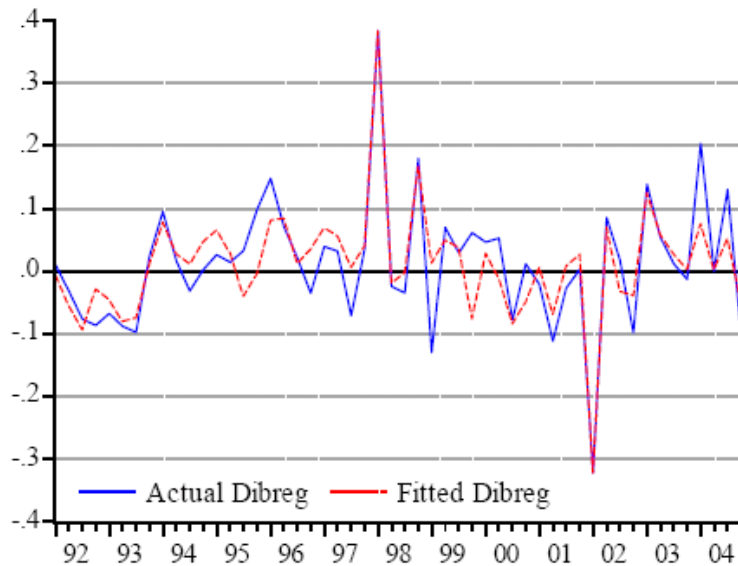


Table 5.2. Responses of *ibreg* to a 1% increase in RHS variables

Quarters	<i>gdp</i>	<i>rcc</i>
Simultaneous	0.00	0.00
Four quarters ahead	1.06	-0.72
Eight quarters ahead	1.02	-0.90
Long run	1.00	-1.00
50% of long-run effect	Overshoots	2Q
90% of long-run effect	Overshoots	8Q

Steady state solution:

$$(ibreg - gdp) = const - rcc$$

Húsnæðisfjárfesting – matsjafna



$$\Delta ih_t = \underbrace{-0.219}_{(3.7)} - \underbrace{0.138Q1}_{(6.3)} - \underbrace{0.035Q2}_{(1.7)} + \underbrace{0.030Q3}_{(1.3)} - \underbrace{0.118D971}_{(7.4)} \\ - \underbrace{0.282\Delta ih_{t-3}}_{(2.6)} - \underbrace{0.079}_{(3.8)}[(ih - gdp) - 1.395(ph - pih)]_{t-1}$$

Adjusted R^2	0.852
Equation standard error	3.15%
Long-run restrictions (F -test)	10.4 [0.00]
LM test for serial correlation (F -test)	0.07 [0.80]
Normality test (χ^2 -test)	2.74 [0.25]
White test for heteroscedasticity (F -test)	6.87 [0.00]
Sample period	1992:Q1-2004:Q4 ($T = 52$)

- IH Private sector housing investment (5.14).
 GDP GDP (5.39).
 PH House prices (7.12).
 PIH Housing investment deflator (7.8).
 $Q1-Q3$ Centered seasonal dummies.
 $D971$ Dummy variable: 1 1997:Q1 and zero elsewhere.

Húsnæðisfjárfesting – eiginleikar jöfnu

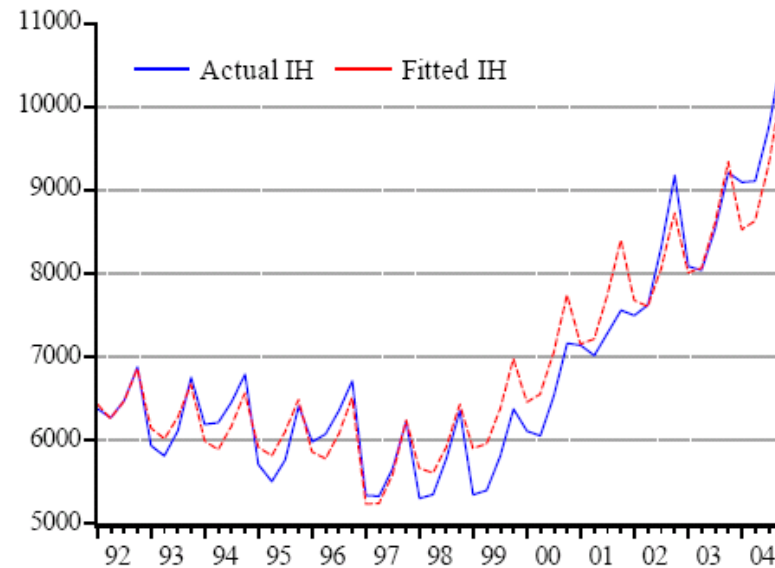
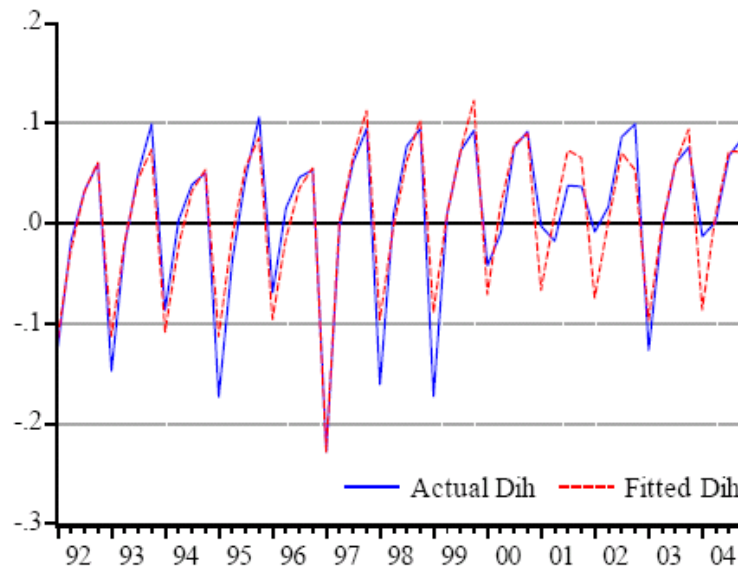


Table 5.3. Responses of ih to a 1% increase in RHS variables

Quarters	gdp	$ph - pih$
Simultaneous	0.00	0.00
Four quarters ahead	0.26	0.36
Eight quarters ahead	0.41	0.57
Long run	1.00	1.40
50% of long-run effect	11Q	11Q
90% of long-run effect	37Q	37Q

Steady state solution:

$$(ih - gdp) = const + 1.395(ph - pih)$$

Almennur útflutningur – matsjafna



$$\Delta exreg_t = \underset{(6.3)}{8.254} - \underset{(3.4)}{0.189}Q1 - \underset{(0.7)}{0.046}Q2 + \underset{(2.9)}{0.142}Q3 - \underset{(2.5)}{0.280}D981 \\ + \underset{(3.6)}{0.308}\Delta exreg_{t-4} - \underset{(6.3)}{0.813}[exreg - trade + 0.480rex]_{t-1}$$

Adjusted R^2	0.847
Equation standard error	10.65%
Long-run restrictions (F -test)	5.66 [0.02]
LM test for serial correlation (F -test)	1.19 [0.28]
Normality test (χ^2 -test)	1.18 [0.56]
White test for heteroscedasticity (F -test)	2.22 [0.04]
Sample period	1990:Q1-2004:Q4 ($T = 60$)

EXREG Exports, excluding aluminium and marine goods (5.26).

TRADE World trade (exogenous).

REX Real exchange rate (4.15).

Q1-Q3 Centered seasonal dummies.

D981 Dummy variable: 1 1998:Q1 and zero elsewhere.

Almennur útflutningur – eiginleikar jöfnu

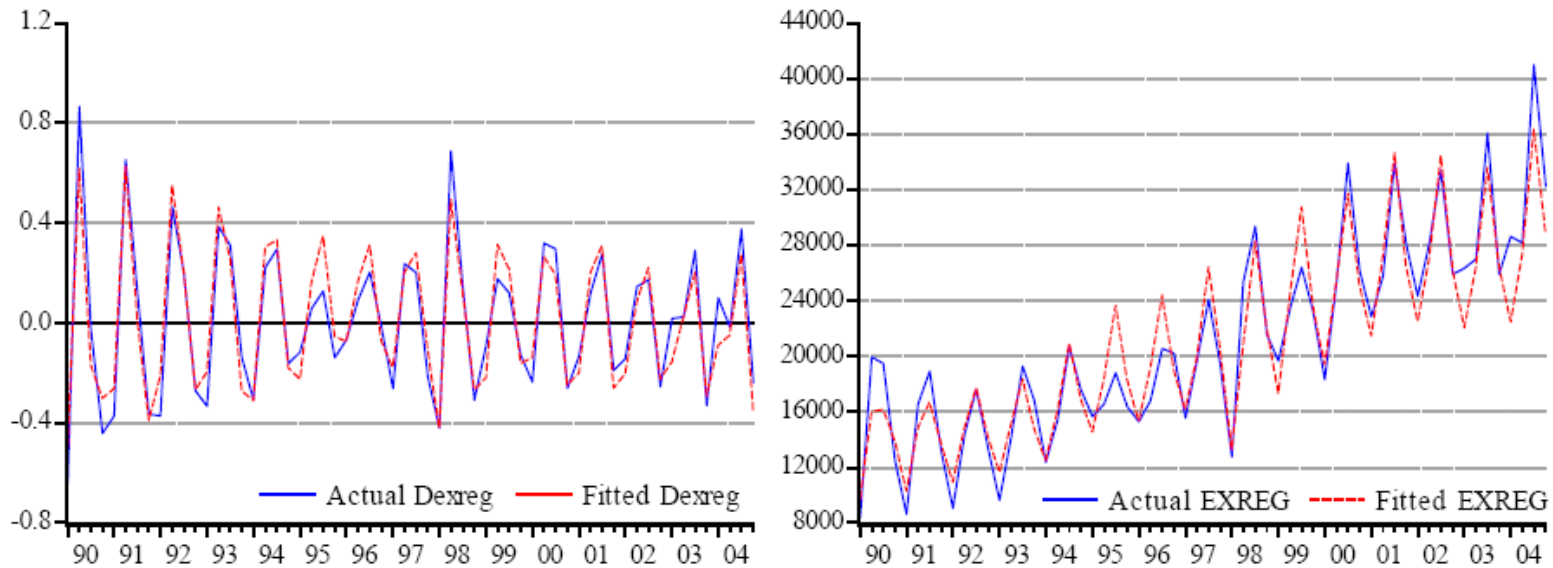


Table 5.4. Responses of *exreg* to a 1% increase in RHS variables

Quarters	<i>trade</i>	<i>rex</i>
Simultaneous	0.00	0.00
Four quarters ahead	1.00	-0.48
Eight quarters ahead	1.01	-0.48
Long run	1.00	-0.48
50% of long-run effect	Overshoots	Overshoots
90% of long-run effect	Overshoots	Overshoots

Steady state solution:

$$(exreg - trade) = const - 0.480rex$$



Innflutningur – matsjafna

$$\begin{aligned}\Delta imp_t = & \underbrace{-0.824}_{(6.4)} + \underbrace{0.029Q1}_{(0.9)} + \underbrace{0.023Q2}_{(1.1)} + \underbrace{0.040Q3}_{(2.1)} \\ & + \underbrace{1.332\Delta dd_t}_{(6.0)} + \underbrace{0.419\Delta dd_{t-4}}_{(1.9)} \\ & - \underbrace{0.841}_{(6.4)}[imp - dd + 0.336rexm - 0.513spec]_{t-1}\end{aligned}$$

Adjusted R^2	0.894
Equation standard error	4.89%
Long-run restrictions (F -test)	5.69 [0.02]
LM test for serial correlation (F -test)	0.18 [0.28]
Normality test (χ^2 -test)	1.01 [0.60]
White test for heteroscedasticity (F -test)	1.60 [0.14]
Sample period	1990:Q1-2004:Q4 ($T = 60$)

- IMP Imports of goods and services (5.30).
 DD Domestic demand (5.23).
 $REXM$ Importers' real exchange rate (4.14).
 $SPEC$ Trade specialisation (5.32).
 $Q1-Q3$ Centered seasonal dummies.

Innflutningur – eiginleikar jöfnu

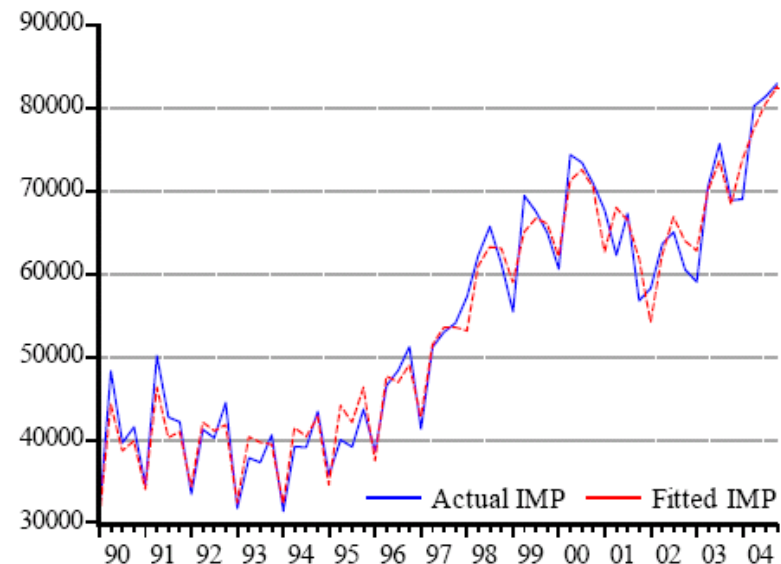
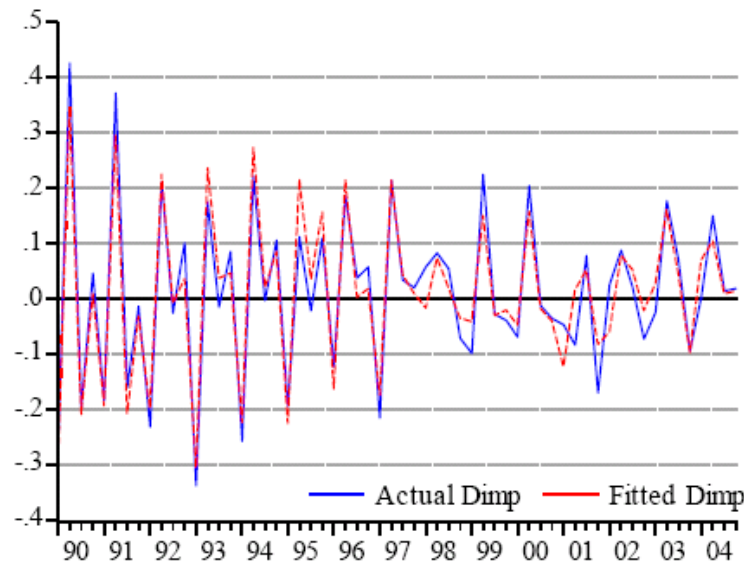


Table 5.5. Responses of *imp* to a 1% increase in RHS variables

Quarters	<i>dd</i>	<i>rexm</i>	<i>spec</i>
Simultaneous	1.33	0.00	0.00
Four quarters ahead	1.00	-0.34	0.43
Eight quarters ahead	1.00	-0.34	0.51
Long run	1.00	-0.34	0.51
50% of long-run effect	Overshoots	1Q	1Q
90% of long-run effect	Overshoots	2Q	2Q

Steady state solution:

$$(imp - dd) = const - 0.336rexm + 0.513spec$$

Framleiðslugeta og -spenna

- Cobb-Douglas framleiðslufall

$$gdpt_t = -1.172 + 0.64 \times 0.0049T + 0.64empt_t + 0.36k_t$$

(59.6) (15.4)

$$EMPT_t = PAT_t \times POWA_t \times (1 - NAIRU_t)$$

GDPT Potential output (5.42).

EMPT Trend employment (6.10).

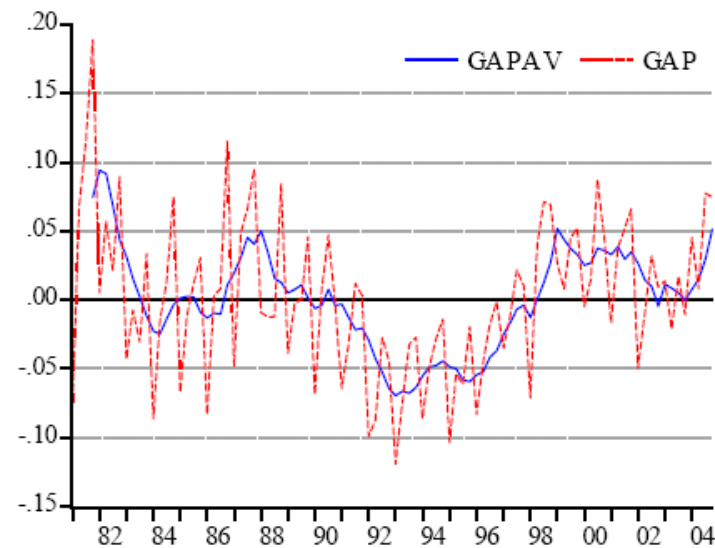
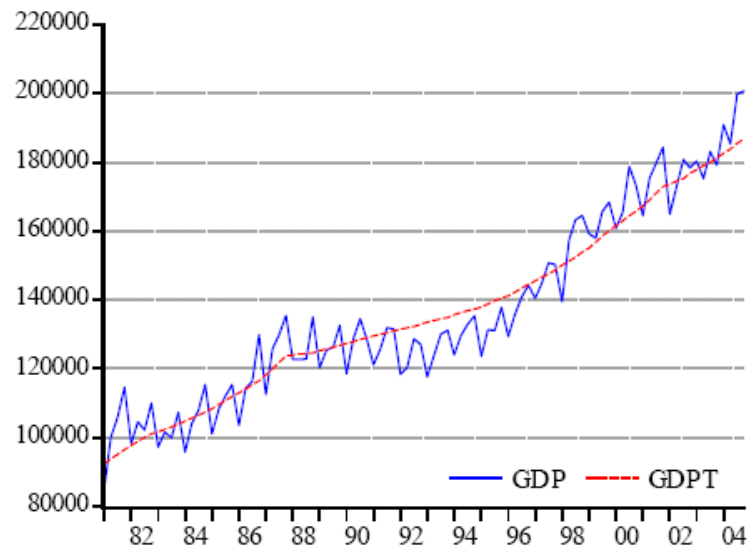
K Capital stock (5.18).

T Linear time trend.

PAT Trend participation rate (6.8).

POWA Population at working age (16-64 years old) (exogenous).

NAIRU Natural rate of unemployment (exogenous).





Launakostnaður – matsjafna

$$\begin{aligned} \Delta(\text{ulct}_t - \text{pgdp}_t) = & \underbrace{-0.234}_{(5.9)} + \underbrace{0.030Q1}_{(5.7)} + \underbrace{0.012Q2}_{(2.8)} + \underbrace{0.003Q3}_{(0.6)} \\ & - \underbrace{0.036D971}_{(3.2)} - \underbrace{0.930\Delta(\text{pgdp}_t - \text{cpi}_t)}_{(7.8)} \\ & - \underbrace{1.002(UR_t - NAIRU_t)}_{(4.5)} + \underbrace{0.367(UR_{t-4} - NAIRU_{t-4})}_{(2.1)} \\ & - \underbrace{0.442[\text{ulct} - \text{pgdp}]_{t-1}}_{(6.0)} + \underbrace{0.0017T}_{(5.9)} \end{aligned}$$

Adjusted R^2	0.701
Equation standard error	1.03%
Long-run restrictions (F -test)	5.06 [0.01]
LM test for serial correlation (F -test)	1.21 [0.28]
Normality test (χ^2 -test)	0.51 [0.77]
White test for heteroscedasticity (F -test)	0.98 [0.49]
Sample period	1992:Q1-2004:Q4 ($T = 52$)

$$ULCT_t = \frac{W_t \times REM_t}{PRODT_t}$$

$$PRODT_t = \frac{GDPT_t}{EMPT_t}$$

W	Wages (6.2).
REM	Employers' wage-related cost (exogenous).
$PRODT$	Trend labour productivity (6.12).
$PGDP$	GDP price deflator (7.10).
CPI	Consumer price index (7.1).
UR	Unemployment rate (6.5).
$NAIRU$	Natural rate of unemployment (exogenous).
$D971$	Dummy variable: 1 1997:Q1 and zero elsewhere.
$Q1-Q3$	Centered seasonal dummies.
T	Linear time trend.

Launakostnaður – eiginleikar jöfnu

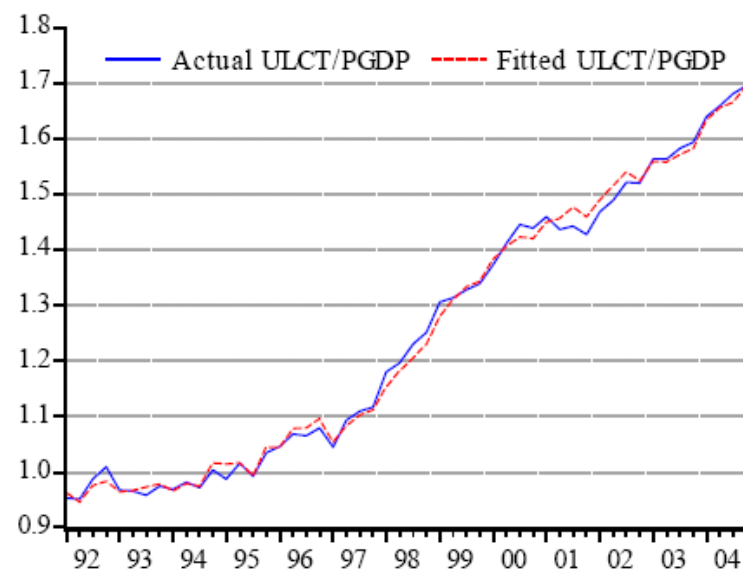
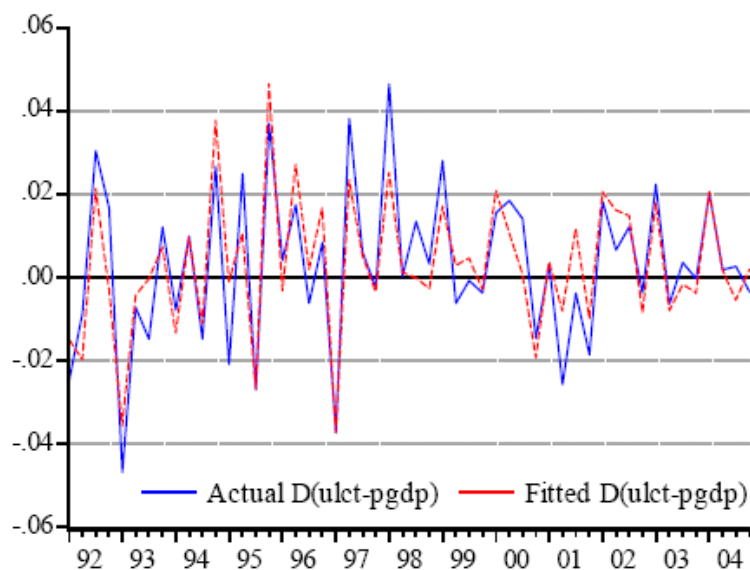


Table 6.1. Responses of w to a 1% increase in RHS variables

Quarters	<i>rem</i>	<i>prodt</i>	<i>pgdp</i>	<i>cpi</i>	<i>UR</i> – <i>NAIRU</i>
Simultaneous	-1.00	1.00	0.07	0.93	-1.00
Four quarters ahead	-1.00	1.00	0.91	0.09	-1.78
Eight quarters ahead	-1.00	1.00	0.99	0.01	-1.47
Long run	-1.00	1.00	1.00	0.00	-1.44
50% of long-run effect	0Q	0Q	2Q	-	Overshoots
90% of long-run effect	0Q	0Q	4Q	-	Overshoots

Steady state solution:

$$(w + rem - prodt - pgdp) = const + 0.0039T$$

Verðbólga – matsjafna



$$\begin{aligned}\Delta cpi_t = & \underset{(11.7)}{0.741} INFE_t/4 + \underset{(1.9)}{0.059} \Delta pm_t + \underset{(2.5)}{0.080} \Delta pm_{t-1} \\ & + (1 - 0.741 - 0.059 - 0.080) \Delta ulct_{t-1} + \underset{(3.6)}{0.072} GAPAV_{t-1}\end{aligned}$$

Adjusted R^2	0.548
Equation standard error	0.46%
Dynamic homogeneity (F -test)	0.18 [0.67]
LM test for serial correlation (F -test)	0.40 [0.53]
Normality test (χ^2 -test)	3.39 [0.18]
White test for heteroscedasticity (F -test)	2.52 [0.02]
Sample period	1994:Q1-2004:Q4 ($T = 44$)

<i>CPI</i>	Consumer price index (7.1).
<i>INFE</i>	Inflation expectations (7.16).
<i>GAPAV</i>	Annual average of output gap (5.44).
<i>PM</i>	Import price deflator (7.2).
<i>ULCT</i>	Trend unit labour costs (6.4).

Verðbólga – eiginleikar jöfnu

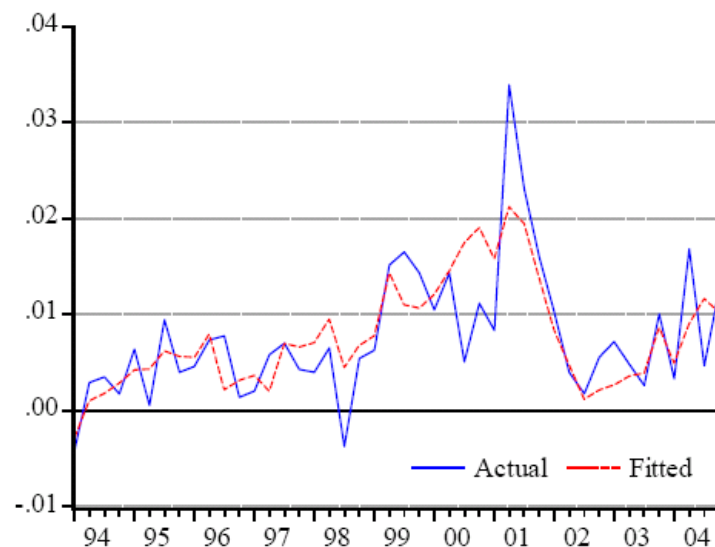


Table 7.1(b). Responses of Δcpi to a 1% increase in RHS variables

Jointly with *INFE* equation (7.17)

Quarters	$IT/4$	Δpm	$\Delta ulct$	$GAPAV$
Simultaneous	0.30	0.06	0.00	0.00
Four quarters ahead	0.52	0.24	0.21	0.12
Eight quarters ahead	0.53	0.25	0.22	0.13
Long run	0.53	0.25	0.22	0.13
50% of long-run effect	0Q	1Q	1Q	1Q
90% of long-run effect	2Q	3Q	3Q	3Q

Steady state solution:

$$\Delta cpi = 0.534IT/4 + 0.250\Delta pm + 0.216\Delta ulct$$

Húsnæðisverð – matsjafna



$$\begin{aligned}\Delta(ph_t - cpi_t) = & \underset{(3.5)}{0.283} - \underset{(5.4)}{0.096D894} + \underset{(4.4)}{0.044D04} \\ & + \underset{(1.8)}{0.165}\Delta(ph_{t-2} - cpi_{t-2}) + \underset{(2.5)}{0.113}\Delta ly_{t-4} - \underset{(2.8)}{1.482}\Delta RLV_t \\ & - \underset{(3.4)}{0.133}[(ph - cpi) + 0.870(kh - ly) + 2.230RLV]_{t-2}\end{aligned}$$

Adjusted R^2	0.530
Equation standard error	1.72%
Long-run restrictions (F -test)	1.05 [0.36]
LM test for serial correlation (F -test)	0.17 [0.68]
Normality test (χ^2 -test)	1.41 [0.49]
White test for heteroscedasticity (F -test)	0.81 [0.62]
Sample period	1989:Q1-2004:Q4 ($T = 64$)

PH House prices (7.12).

CPI Consumer price index (7.1).

KH Private sector housing stock (5.20).

LY Real post-tax labour income (9.7)

RLV Long-term indexed interest rate (4.4).

D894 Dummy variable: 1 1989:Q4 and zero elsewhere.

D04 Dummy variable: 1 2004:Q1-2004:Q4 and zero elsewhere.

Húsnæðisverð – eiginleikar jöfnu

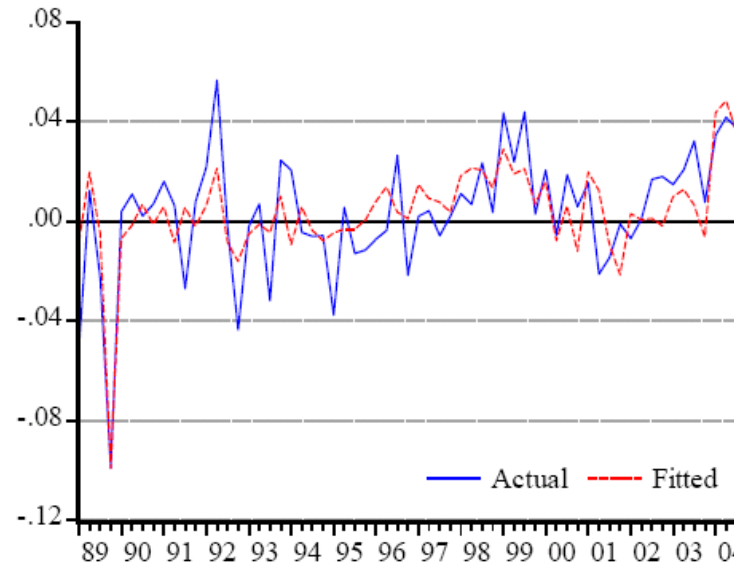


Table 7.5. Responses of $ph - cpi$ to a 1% increase in RHS variables

Quarters	kh	ly	RLV
Simultaneous	0.00	0.00	-1.48
Four quarters ahead	-0.35	0.46	-2.04
Eight quarters ahead	-0.67	0.76	-2.18
Long run	-0.87	0.87	-2.23
50% of long-run effect	5Q	4Q	0Q
90% of long-run effect	11Q	9Q	4Q

Steady state solution:

$$(ph - cpi) = const - 0.870(kh - ly) - 2.230RLV$$



Nokkrar aðrar verðjöfnur

- Verðvísitala samneyslu

$$\Delta pg_t = \underset{(2.5)}{0.006Q1} - \underset{(5.8)}{0.014Q2} - \underset{(2.0)}{0.004Q3} + \underset{(6.2)}{0.028D012} \\ + \underset{(4.9)}{0.351\Delta pg_{t-1}} + \underset{(8.3)}{0.451\Delta ulct_t} + (1 - 0.351 - 0.451)\Delta cpi_t$$

- Verðvísitala fjárfestingar

$$\Delta pi_t = \underset{(0.2)}{0.001Q1} - \underset{(3.3)}{0.012Q2} - \underset{(4.4)}{0.016Q3} + \underset{(13.9)}{0.660\Delta bc_t} + (1 - 0.660)\Delta pm_t$$

- Verðvísitala innflutnings

$$\Delta pm_t = \underset{(6.6)}{0.636\Delta(wpx_t + eer_t)} + \underset{(2.0)}{0.123\Delta(wpx_{t-1} + eer_{t-1})} + \underset{(1.3)}{0.069\Delta(pcom_t + eus_t)} + \underset{(2.8)}{0.159\Delta ulct_{t-2}} \\ + (1 - 0.636 - 0.123 - 0.069 - 0.159)\Delta(poil_{t-1} + eus_{t-1})$$

- Verðvísitala útflutnings

$$\Delta pxreg_t = \underset{(1.8)}{0.126\Delta cpi_{t-2}} + \underset{(15.1)}{0.754\Delta(wcpi_t + eer_t)} \\ + (1 - 0.126 - 0.754)\Delta(wcpi_{t-2} + eer_{t-2}) + \underset{(9.6)}{0.089D971} - \underset{(5.9)}{0.055D981}$$

- Byggingarvísitala

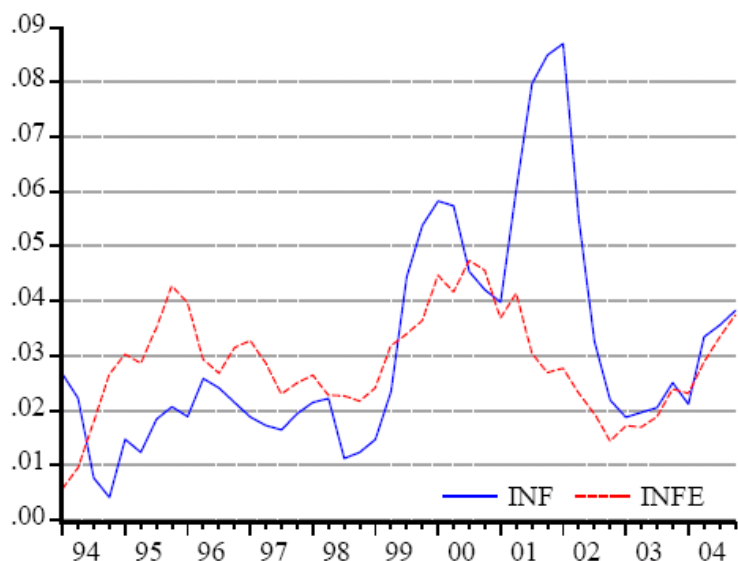
$$\Delta bc_t = \underset{(3.9)}{0.303\Delta bc_{t-1}} + \underset{(5.2)}{0.472\Delta cpi_t} + (1 - 0.303 - 0.472)\Delta ulct_t + \underset{(4.0)}{0.025D021}$$

Verðbólguvæntingar



- Sögulegar mælingar

$$INFE_t = (RL_t - RLV_t) - PRISK_t$$



- Spá- og hermunarjafna

$$INFE_t = \omega_{pe} INF_{t-1} + (1 - \omega_{pe}) IT_t$$

$$\omega_{pe} = 0.6$$

- Þegar búið er að þróa langtímaeiginleika QMM munu væntingar vera framsýnar (rational expectations)



Eiginleikar QMM

Sögulegur samanburður



- Kvik hermun fyrir tímabilið 1995-2005
 - Ytri stærðir gefnar
 - Stýrivextir gefnir
- Nær að líkja ágætlega eftir sögulegri þróun en missir af gengissveiflu

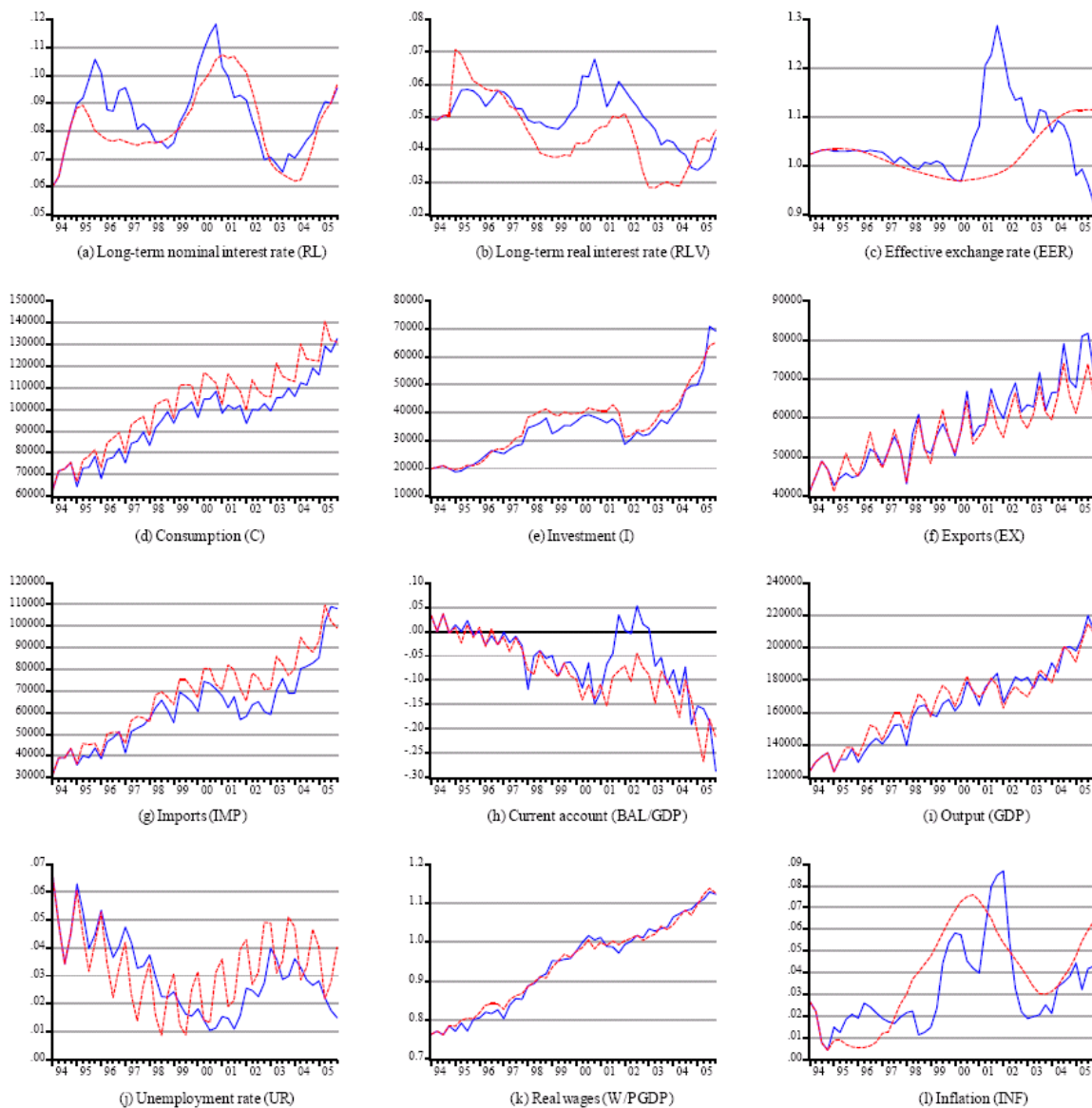


Figure 10.1. Comparison of actual (solid line) and simulated (broken line) data 1994-2005



Sögulegur samanburður

- Tekin út árstíðarsveifla og einblínt á hagsveiflutíðni
 - 6-32 ársfjórðungar; talin vera hefðbundin hagsveifla
- Hagsveifluhegðun í takti við alþjóðlegar niðurstöður
- QMM tekst að líkja eftir meginhegðun íslensku hagsveiflunnar
- Fylgni raunverulegrar og metinnar hagsveiflu ágæt

Table 10.3. Correlations between cyclical components of actual and simulated data

Series	Correlation	Series	Correlation	Series	Correlation
GDP	0.58	BAL/GDP	0.95	PH	0.84
C	0.90	EMP	0.67	INF	0.28
G	1.00	UR	0.65	RS	1.00
I	0.92	PA	0.52	RLV	0.57
IBUS	0.84	PRODT	0.87	M3	0.75
IH	0.57	W	0.89	EQP	-0.13
II/GDP	-0.18	W/PGDP	0.72	WEL	0.81
EX	0.47	CPI	0.52	REX	-0.26
IMP	0.83	PGDP	0.73	WGDP	1.00

Miðlun peningastefnunnar í QMM

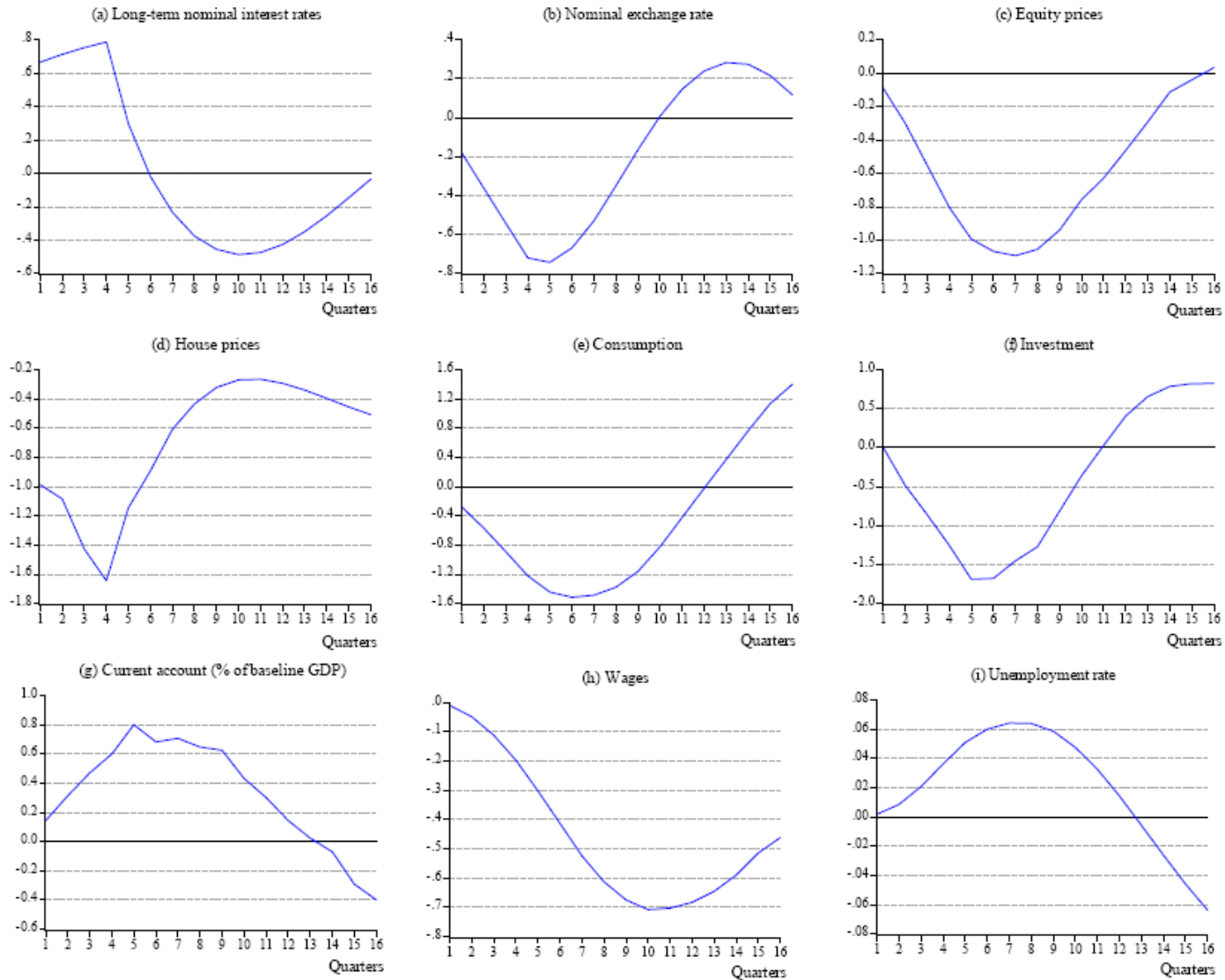


Figure 3.3. Responses of key variables to a monetary policy shock (deviations from baseline)

Miðlun peningastefnunnar í QMM



- Miðlunartafir og stærð áhrifa í takti við fyrri innlendar rannsóknir og niðurstöður alþjóðlegra rannsókna

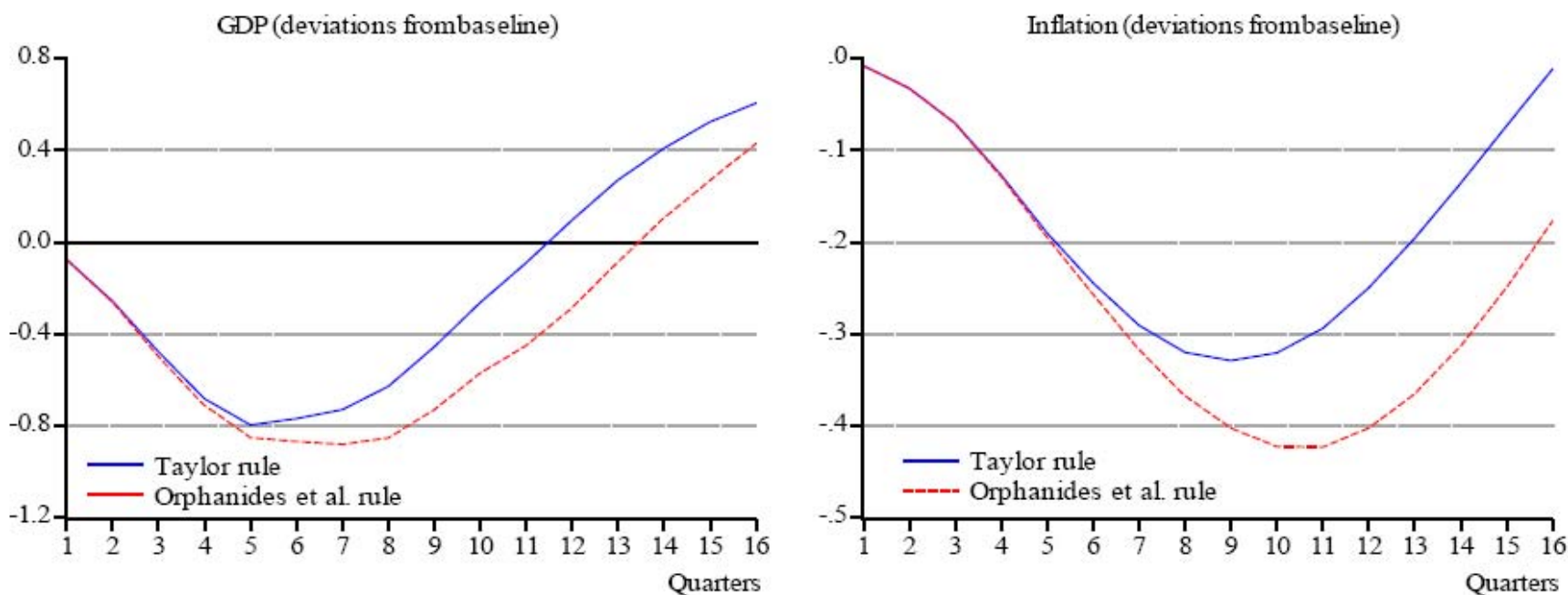


Figure 3.2. Response to 1 percentage point rise in monetary policy rate for one year



Frekari vinna við QMM og nýtt jafnvægislíkan

Langtímaeiginleikar QMM



- QMM er ekki leitt út frá vel skilgreindum háþörfvandanámálum grunneininga hagkerfisins
 - Ekki er sjálfkrafa tryggt að líkanið leiti í stöðugt langtímaþvægi til langs tíma
- Til langs tíma þurfa
 - Nafnstærðir að vaxa allar um sama hlutfallið: Verðbólgaþvægi
 - Raunstærðir vaxa allar um sama hlutfallið (balanced growth) sem er jafnt summu leitnivaxtar mannafla og framleiðni
 - Til langs tíma er ekkert samband á milli nafn- og raunstærða líkansins: Peningastefnan er hlutlaus til langs tíma
- Skilyrði 1 og 3 eru þegar uppfyllt í QMM en til að tryggja skilyrði 2 þarf að setja viðbótarskilyrði á fasta, útgjaldahlutföll og hlutfallsleg verð
- Verið að vinna við þetta
 - Núverandi líkan hentar hins vegar vel við spágerð og skammtímahermanir

Annmarkar QMM



- Skortir vel skilgreinda háþrókunareiginleika
- Vantar að skilgreina betur framsýna hegðun
- Vantar að skilgreina betur flæðis- og stofnsambönd
- Tölfræðilega metið líkan og getur því verið viðkvæmt fyrir breytingum í hegðunarsamböndum
 - Sérstaklega ef kerfisbreytingar hafa orðið í hagkerfinu – samanber breytingu á stjórn peningamála
- Viðkvæmt fyrir gagnrýni Lucasar og því þarf að fara varlega í hagstjórnartilraunir



Nýtt jafnvægislíkan

- Verið að þróa lítið „einfalt“ heildarjafnvægislíkan (DSGE) sem tekur á þessum vandamálum
 - Byggt á líkani sem er þróað af IMF (Hunt, 2006) og á sambærilegum líkönum sem notuð eru í ýmsum seðlabönkum
- Er hins vegar lítið og því vantar sundurliðun og upplýsingar um margar hagstærðir
 - Nýja líkanið verður því notað samhliða QMM
- Með þessum 2 líkönum ætti bankinn að vera vel í sveit settur við spágerð og hagstjórnartilraunir