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## **Technical memorandum prepared by the Central Bank of Iceland on the economic criteria in the amended parliamentary bill on the State guarantee for the Icesave agreements**

*The specifics of the documents are technical in nature, and a review of the matter should be presented by the Central Bank of Iceland.*

### **1. Introduction**

On June 5, 2009, the governments of the Netherlands and the United Kingdom signed agreements with the Icelandic Depositors' and Investors' Guarantee Fund (DIGF) to reimburse the UK and the Netherlands for their contributions to eligible depositors in the Dutch and British branches of Landsbanki Íslands. The Icelandic Government is a signatory and will provide a State guarantee of the outstanding amount to be paid over the remaining 8 years of the agreements.

According to Icelandic law, the State guarantee requires parliamentary approval. Parliament has been working on the bill for the last two months under the supervision of the Parliamentary Budget Committee. The Icelandic Government has stressed the importance of obtaining a broad consensus for the State guarantee among all major political parties in Parliament. After two months of discussions and consultations with various institutions and experts, the Budget Committee presented proposals for amendments to the parliamentary bill authorising the Minister of Finance to issue a State guarantee of the loans granted by the governments of the UK and the Netherlands to the Depositors' and Investors' Guarantee Fund of Iceland, so as to enable it to cover payments to the depositors of Landsbanki. (*Attachment 1, Parliamentary document no. 204 - Case no. 136, 137th Legislative Session 2009*).

The Central Bank of Iceland was asked by the Parliamentary Budget Committee to provide technical assistance with the calculations of the economic limit introduced in the amended parliamentary bill on the State guarantee. The economic limit is structured in such a way that the Icelandic authorities will fulfil their financial obligations according to the Icesave agreements over the period of 2017-2023, with accrued interest. In addition, the Central Bank of Iceland was asked by the Ministry of Finance to prepare a technical background note to provide an overview of the main economic assumptions used in the calculations.

The paper is divided into three parts:

- Discussions on economic criteria introduced in the amended bill.
- Estimated payment profile derived from the baseline scenario and economic criteria.
- Technical background note on the baseline scenario.

## 2. Discussions on economic criteria introduced in the amended bill

The main economic criteria in the amended bill state that the State guarantee is subject to a limit. This maximum, for the period 2017-2023, is limited to 4% of the accumulated growth in the gross domestic product (GDP) from 2008 measured in pounds sterling (GBP) with respect to the loan agreement with the British government, and 2% of the accumulated growth of GDP from 2008 measured in euros (EUR) with respect to the loan agreement with the Dutch government. The percentages for the years 2016 and 2024 will be equal to 50% of these figures. The payments will be revised as soon as definitive figures for GDP are available.

The calculation of the payment limit shall be based on the average Central Bank of Iceland mid-rate of exchange for the GBP and the EUR with respect to the Icelandic króna (ISK), on a yearly basis, and on an assessment of GDP as defined by Eurostat.

## 3. Estimated payment profile derived from the baseline scenario and economic criteria

The proposed rule can be formalised as stating that the maximum payment during year  $k$  is equal to:

$$\text{in pounds: } a \left( \frac{GDPN_k}{E_k^{GBP}} - \frac{GDPN_{2008}}{E_{2008}^{GBP}} \right); \text{ in euros: } b \left( \frac{GDPN_k}{E_k^{EUR}} - \frac{GDPN_{2008}}{E_{2008}^{EUR}} \right)$$

Converting this into ISK (using annual average exchange rates) in year  $k$  gives:

$$a \left( GDPN_k - GDPN_{2008} \frac{E_k^{GBP}}{E_{2008}^{GBP}} \right) + b \left( GDPN_k - GDPN_{2008} \frac{E_k^{EUR}}{E_{2008}^{EUR}} \right)$$

where  $GDPN$  is nominal GDP in ISK,  $E^{GBP}$  is the ISK/GBP exchange rate and  $E^{EUR}$  is the ISK/EUR rate. According to the economic criteria set out by Parliament,  $a = 4\%$  and  $b = 2\%$  in 2017-2023, but  $2\%$  and  $1\%$  respectively in 2016 and 2024. The parameters,  $a$  and  $b$ , are chosen such that the rule gives a present value of the repayments that is equal to the present value of the Icesave loans (with a narrow margin), assuming the interest rate of 5.55% from the Icesave agreement.

To simplify the analysis, the Central Bank has estimated the payments as if the repayment period were 2016-2023 instead of June 5, 2016, to June 5, 2024 (with the first payment on September 5, 2016). In these calculations, the interest on the debt by the end of 2015 is calculated for the full year 2016, and it assumed that payment will be remitted

in one lump sum at the end of the year. The same is assumed for later years. This means that these calculations assume a somewhat heavier repayment burden than are in the agreements because payments take place at later dates than is stipulated by the agreement. To compensate for this, the maximum payment is calculated on the basis of the two last quarters of the relevant year and the two first quarters of the following year. Table 1 reports the main results.<sup>1</sup>

Table 1. Key variables and payment profile

	2008	2016	2017	2018	2019	2020	2021	2022	2023
GDP, 2000 prices	932.4	1,023.8	1,062.7	1,105.6	1,151.5	1,198.8	1,251.1	1,308.2	1,364.5
GDP (bISK)	1,465.1	2,068.1	2,212.2	2,367.0	2,533.4	2,701.2	2,875.7	3,063.9	3,252.1
ISK/GBP rate	158.75	165.61	167.19	169.00	170.78	171.13	168.44	162.54	155.48
ISK/EUR rate	126.98	147.62	149.03	150.64	152.23	152.54	150.14	144.88	138.59
GDP in bGBP	9.2	12.5	13.2	14.0	14.8	15.8	17.1	18.8	20.9
GDP in bEUR	11.5	14.0	14.8	15.7	16.6	17.7	19.2	21.1	23.5
Increase compared to 2008 (millions)									
GDP in mGBP	0	3,260	4,003	4,777	5,606	6,556	7,844	9,621	11,688
4% thereof	0	130	160	191	224	262	314	385	468
GDP in mEUR	0	2,473	3,307	4,175	5,105	6,171	7,616	9,610	11,928
2% thereof	0	49	66	84	102	123	152	192	239
Maximum payment and estimated payments in ISK billions									
Pymt. cap in bISK	0.0	28.9	36.6	44.9	53.8	63.7	75.7	90.4	105.8
Est. payment	0.0	28.9	36.6	44.9	53.8	63.7	75.7	90.4	60.0

*Note:* 2008 denotes the calendar year 2008 while 2016 denotes the sum of Q3 and Q4 in 2016 and Q1 and Q2 in 2017. The same applies for the columns 2017-2023.

Assuming a 75% recovery rate from Landsbanki assets, it is estimated that the debt by the end of 2015 will be GBP 1,376 million and EUR 778 million. By June 5, 2016, this debt is estimated to be GBP 1,409 million and EUR 797 million.

The Central Bank has also estimated the quarterly payment schedule according to the rule above. For these calculations, assumptions concerning distribution of payments over the years are needed, as the rule specifies only the aggregate payments. In the calculations below, it is assumed that the distribution over the year follows the same pattern as the estimated distribution of payments according to the Icesave agreement. Table 2 reports the main results.

<sup>1</sup> A comparison of the results in Table 1 and Table 2 below, where a more precise method is used to calculate payments, shows that this approximation is reasonable. Earlier analysis from the Bank has used the sum of GDP for Q2-Q4 of the respective year and Q1 of the following year, but the method used here gives a slightly better approximation of the correctly estimated payments and debt positions using quarterly data shown in Table 2.

Table 2. Payment profile - year-end balances

Unit: ISK billions	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
According to the agreement and baseline forecast										
Year-end balance	350.0	333.5	291.9	249.6	206.5	161.3	113.7	66.0	21.0	0.0
Instalments		22.0	44.1	44.5	45.0	45.4	45.1	44.0	42.1	20.3
Payments		31.6	61.5	59.7	57.8	55.8	52.9	49.1	44.7	20.7
Interest		9.6	17.4	15.1	12.8	10.4	7.8	5.2	2.6	0.4
If the rule specifying a cap of 4% and 2% is used and the baseline forecast										
Year-end balance	350.0	353.1	342.6	323.4	294.2	251.4	190.5	110.1	21.0	0.0
Maximum pymt.		12.4	32.9	40.7	49.4	58.6	69.5	82.8	98.3	56.3
Payments		12.4	32.9	40.7	49.4	58.6	69.5	82.8	73.0	20.7
Interest		9.7	19.1	18.4	17.1	15.2	12.5	8.7	3.9	0.4

Note: As the loan is issued (with interest from the beginning of 2016) on June 5, 2016, the interest on the debt is larger than the interest due on the loan on September 5 and December 5, 2016. It is only the latter amount that is shown in this table.

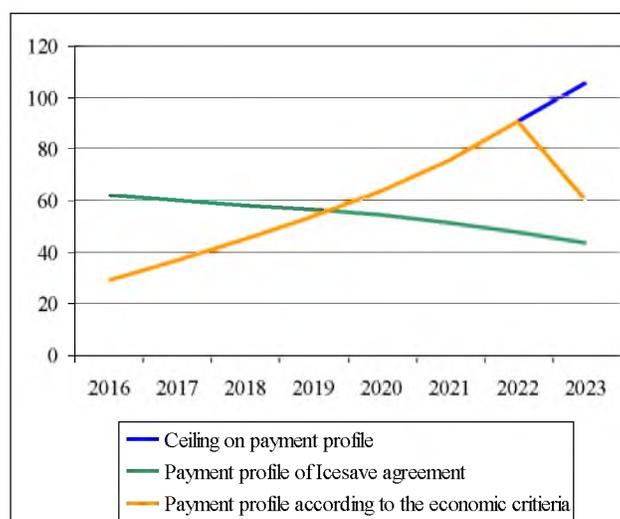


Figure 1. Payment profiles of Icesave agreement and according to economic criteria (ISK millions)

As Figure 1 shows,<sup>2</sup> these economic criteria change the payment profile from the original downward-sloping profile of the Icesave agreement to an upward-sloping profile, with the payment schedule bounded by the limit set out by the economic criteria for the entire period except the last year.<sup>3</sup> However, the present value of both payment schedules is the

<sup>2</sup> The data in the figure are calculated using the approximations to annualised values discussed in connection with Table 1 and in Footnote 1.

<sup>3</sup> Note again that payment years refer not to calendar years but to the two last quarters of the relevant year and the two first quarters of the following year.

same, based on the baseline scenario.<sup>4</sup> Different economic outcomes could obviously lead to different present values.

Figure 2 is based on the same data as Figure 1. It shows the two payment profiles as a share of nominal GDP. Both profiles remain below 3% of nominal GDP throughout, with the peak payment burden in 2022 according to the economic criteria set out by Parliament, instead of at the beginning of the repayment period in the Icesave agreement.

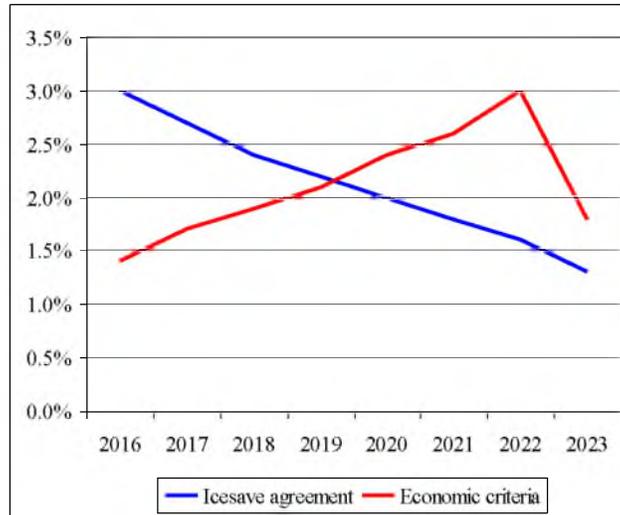


Figure 2. Payment profiles of Icesave agreement and estimated payments using the economic criteria (% of GDP)

## 4. Technical background note on the baseline scenario

### 4.1. Output growth in Iceland in a historical perspective

Figure 3 shows annual output growth in Iceland for the period 1980-2008 (GDP at constant prices). As the figure shows, output growth in Iceland has been quite volatile throughout the period.

Average growth over this period is given at 3.1%, with a standard deviation of 3.0%. The standard deviation of average growth over these 28 years is given at 0.55%. Thus, based on historical data, the probability of output growth below 2.5% during the next decades is not greater than 20%, while the probability of output growth below 2.0% is not greater than 5%.

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<sup>4</sup> This implicitly assumes that the delayed payments according to the new payment profile are borrowed on the same terms as are set out in the original Icesave agreement.

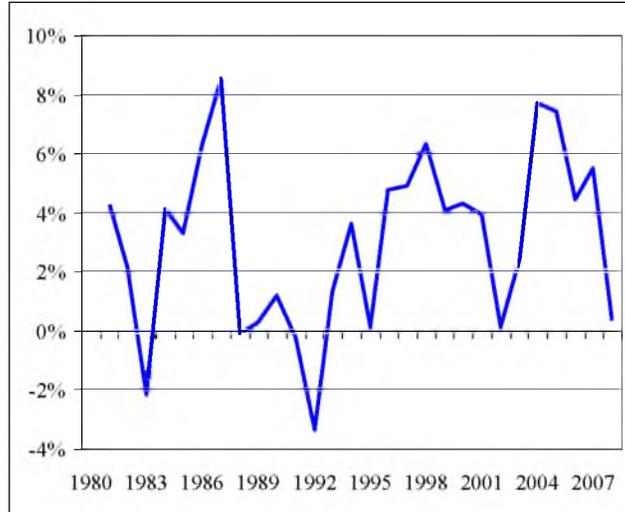


Figure 3. Annual GDP growth in Iceland 1980-2008

Figure 4 shows that average growth has been historically high in recent years (using a 10-year rolling window), or around 4-4.5%, while the volatility of output has declined somewhat.<sup>5</sup>

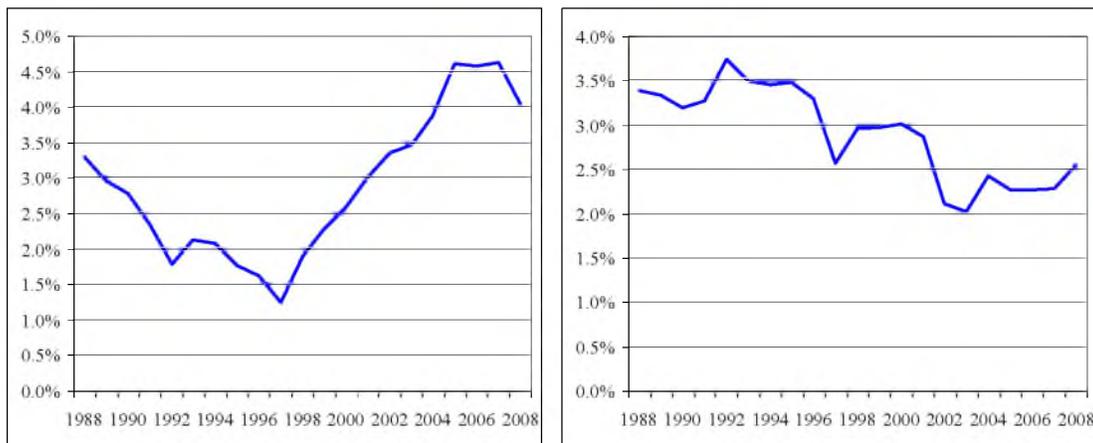


Figure 4. GDP growth: average (Figure a) and standard deviation (Figure b) using a 10-year rolling window

<sup>5</sup> For further discussion of Iceland’s growth dynamics, see Ásgeir Danielsson (2008), “The great moderation Icelandic style”, Central Bank of Iceland, Working Paper no. 39. For an analysis of the Icelandic business cycle, see, for example, Thórarinn G. Pétursson (2000), “Business cycle forecasting and regime switching”, Central Bank of Iceland, Working Papers, no. 7. For a comparison of output volatility in Iceland with international experience, see Thórarinn G. Pétursson (2008), “How hard can it be? Inflation control around the world”, Central Bank of Iceland, Working Papers no. 40.

## 4.2. Output growth forecast in the baseline scenario

The Central Bank's baseline forecast for output growth in the period 2009-2024 is based on the Bank's macroeconomic model, QMM, and the balanced-growth version of that model, QMM-SS.<sup>6</sup>

In QMM, the supply side of the economy is formulated with a standard constant-returns-to-scale Cobb-Douglas production function:

$$Y_t = A(\exp(\gamma T)N_t)^\beta K_t^{1-\beta}$$

where  $Y$  is GDP,  $A$  is a constant,  $N$  is trend employment, and  $K$  is the capital stock. Based on historical data, the labour share ( $\beta$ ) is given as 0.7. The exogenous labour-augmented technical progress is captured by a linear trend,  $\gamma T$ .

This forms the basis for the long-term growth forecast in the baseline scenario; i.e., along the balanced growth path, the capital-output ratio is constant and the output growth rate is therefore given as the sum of technical progress and trend employment growth (with a dot over a variable denoting growth rate):

$$\dot{Y} = \gamma + \dot{N}$$

Estimating  $\gamma$  for the sample period 1981-2006 gives  $\gamma = 0.55\%$ , or 2.2% annualised. With trend employment growing at roughly 1% annually, this gives a long-term trend growth of output of roughly 3.2%.

## 4.3. Main assumptions of the baseline scenario

The macroeconomic scenario used for the calculations in relation to the Icesave negotiations is based on the Central Bank's baseline scenario from *Monetary Bulletin* 2009/2, published in May 2009.<sup>7</sup> The baseline forecast in May was published for the period 2009-2011 but is extended for the period beyond that using the underlying model simulation. The outlook for the period beyond 2011 is therefore not a formal forecast from the Bank.

The long-term growth forecast for the working age population is based on Statistics Iceland's population projections. Average population growth over the period 1980-2008 has been 1.2% (1.1% over the estimation period of the production function) with a standard deviation of 0.6%. The forecast assumes that the population growth rate will fall well below trend in the next few years, and will actually decline in the next two years. The forecast therefore assumes that, in 2012, the working-age population will be roughly 11 thousand less than it would have been had it grown in line with its trend growth. The

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<sup>6</sup> QMM is a standard forward-looking, small open economy model. For details on QMM, see Ásgeir Danielsson, Magnús F. Gudmundsson, Svava J. Haraldsdóttir, Thorvardur T. Ólafsson, Ásgerdur Ó. Pétursdóttir, Thórarinn G. Pétursson and Rósa Svavarsdóttir (2009), "QMM: A Quarterly Macroeconomic Model of the Icelandic Economy, Version 2.0", Central Bank of Iceland, Working Paper no. 41. Ásgeir Danielsson (2009), "QMM: A steady state version", Central Bank of Iceland, Working Paper, forthcoming, describes the balanced growth version of QMM.

<sup>7</sup> Since these calculations were completed, the Bank has published an updated forecast in *Monetary Bulletin* 2009/3, which appeared in early August.

loss in terms of trend employment is even larger, as labour participation will also fall: in 2012, the number of employed will be roughly 18 thousand less than it would have been had employment developed according to its long-term trend growth.

Although the working age population is assumed to grow at the 1% trend rate from 2013 onwards, trend employment is forecast to grow faster during the recovery phase 2015-2020, or around 1.5-2%, before gradually falling towards the 1% trend rate. In addition, with the equilibrium real exchange rate remaining temporarily below its long-term value (see below), the forecast also gives trend productivity growth above its 2.2% long-term value for most of the period. Output is therefore forecast to grow above its long-term trend value after the recovery following the financial crisis before gradually falling down towards trend value by the end of the forecast period as shown in Figure 5, which shows the forecast for output growth according to the baseline scenario from 2008 to 2025.<sup>8</sup>

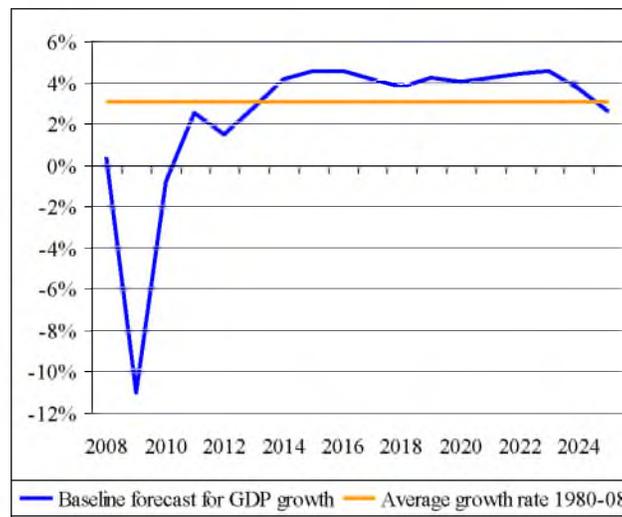


Figure 5. Annual GDP growth in baseline scenario 2008-2025

In QMM, the real exchange rate is given by a forward-looking interest rate parity condition, but also allowing for some inertia in investors' behaviour:<sup>9</sup>

$$(q_t - q^*)_t = \alpha(q_{t-1} - q^*) + \beta(q_{t+1}^e - q^*) + (r_t - r_t^f - \theta_t)$$

where  $q$  is the log real exchange rate,  $q^*$  is the log equilibrium real exchange rate,  $q^e$  is the (model consistent) expected real exchange rate,  $r$  is the domestic short-term real interest rate,  $r^f$  is the short-term foreign real interest rate, and  $\theta$  is a currency risk premium.

<sup>8</sup> This forecast is broadly in line with forecasts available from international institutions. For example, the IMF's *World Economic Outlook* in April 2009, forecasts output in Iceland to grow by 3.8% in 2014, compared to 4.2% in the baseline scenario.

<sup>9</sup> For further discussion, see pages 24-25 of Ásgeir Danielsson, Magnús F. Gudmundsson, Svava J. Haraldsdóttir, Thorvaldur T. Ólafsson, Ásgerdur Ó. Pétursdóttir, Thórarinn G. Pétursson and Rósa Svavarsdóttir (2009), "QMM: A Quarterly Macroeconomic Model of the Icelandic Economy, Version 2.0", Central Bank of Iceland, Working Paper no. 41.

Figure 6 shows the real exchange rate (relative consumer prices) from 1980-2008 (index value of 1 in 2000).

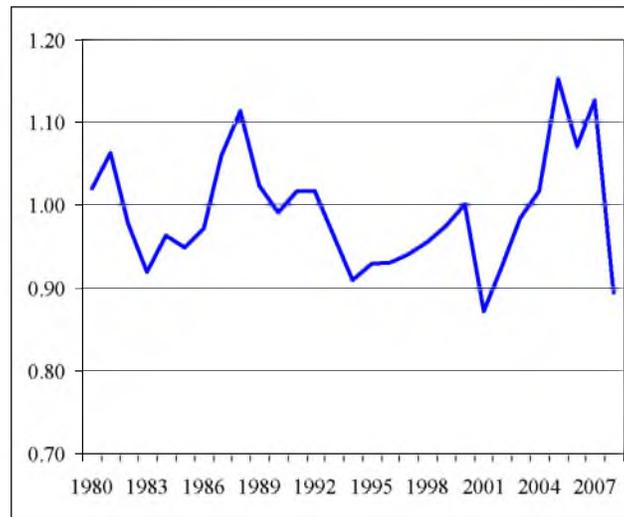


Figure 6. Real exchange rate in Iceland 1980-2008

Based on an analysis by the Bank and the IMF, the QMM assumes a long-term equilibrium real exchange rate of 0.9, which is 9% below its historical average.<sup>10</sup>

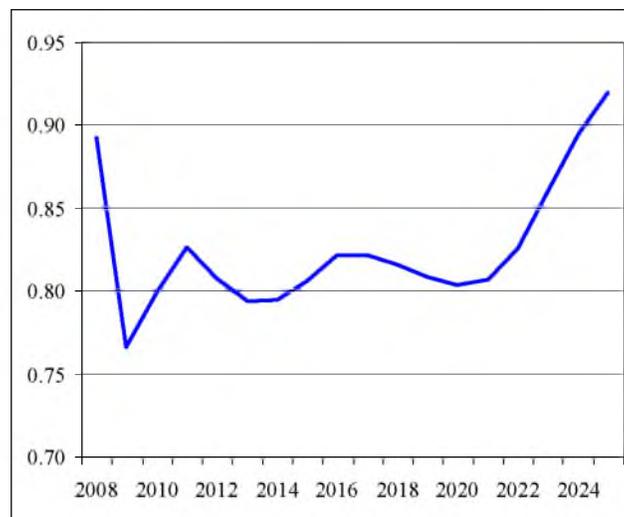


Figure 7. Real exchange rate in baseline scenario 2008-2025

The baseline forecast, however, assumes that the equilibrium real exchange will fall temporarily below its long-term value following the financial crisis, in line with the

<sup>10</sup> See Ásgeir Danielsson (2009), “QMM: A steady state version”, Central Bank of Iceland, Working Paper, forthcoming, which discusses the balanced growth version of QMM and Robert Tchaidze (2007), “Estimating Iceland’s real equilibrium exchange rate”, IMF Working Papers no. 07/276. Note that Iceland had a current account deficit for almost all of this period.

experience of other countries.<sup>11</sup> The real exchange rate will therefore remain roughly 10% below its long-term equilibrium value for most of the period but will be back at its long-term value by the end of the forecast period, as is shown in Figure 7.

The nominal exchange rate forecast is simply derived from the real exchange rate forecast, using the real exchange rate definition:

$$E_t = P_t / (Q_t \times P_t^f)$$

where  $E$  is the effective nominal exchange rate (the number of krónur per 1 unit of foreign currency),  $P$  is the domestic price level, and  $P^f$  is the foreign price level. The forecast for the GBP and EUR assumes a stable cross-exchange rate vis-à-vis the effective rate.

Other key assumptions of the baseline forecast include the following:<sup>12</sup>

- International economy: The macroeconomic forecast is based mainly on the most recent OECD forecast, with underlying balanced growth assumptions used to extend the forecast period until 2024. Forecasts for key commodity prices are derived from futures contracts.
- Domestic inflation: The QMM uses a standard forward-looking Phillips curve to forecast inflation. As is standard in this type of model, all prices are assumed to grow at a steady-state value equal to the Central Bank's inflation target. Thus domestic inflation converges to the inflation target in steady state. For simplicity, it is assumed that the steady-state value of foreign inflation equals the domestic steady-state value.

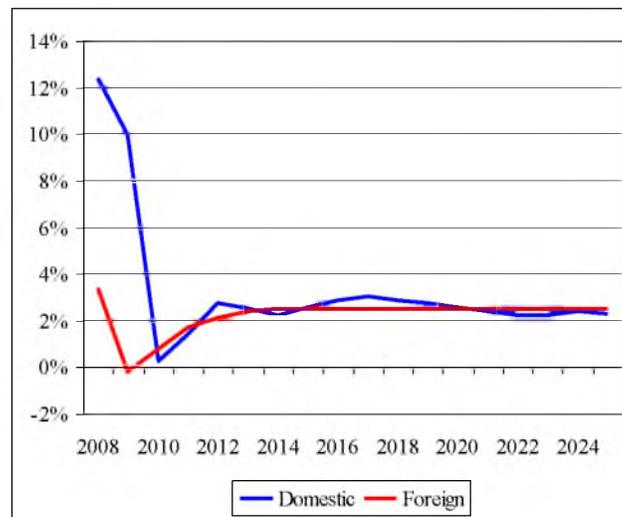


Figure 8. Domestic and foreign inflation in baseline scenario 2008-2025

<sup>11</sup> For example, the crisis is assumed to lead to a temporary loss of human capital and adjustment costs as workers are trained in new skills when resources shift away from sectors related to the economic bubble in the run-up to the crisis, towards export-related sectors. The ensuing credit crunch also leads to a run-down of capital and increased capital scrapping. For further details, see the discussion in *Monetary Bulletin* 2009/2.

<sup>12</sup> The forecast assumptions are explained in greater detail in *Monetary Bulletin* 2009/2.