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Iceland: High Growth, Low Inflation and Current Account Surpluses: What's behind this Remarkable Performance?

By Bernhard Boehm and Ivan Kusen

Summary

Iceland currently features an impressive combination of favourable macroeconomic indicators, such as high output growth, low inflation and current account surpluses. This is in stark contrast to 10 years ago, when Iceland's economy was at the brink of collapse, suffering from a major banking crisis which erupted with the bursting of the 2007-2008 financial sector bubble.

This country brief explores the main factors behind Iceland's remarkable economic recovery. Among others, the paper also analyses whether Iceland's sharp exchange rate depreciation in the wake of the crisis and its appreciation during the recovery has helped to smoothen the country's output fluctuations. The paper uses structural Vector Autoregression (VAR) estimates to assess the impact of exchange rate fluctuations on Iceland's economy.

Key ingredients for Iceland's strong economic performance have been a solid crisis response by Iceland's authorities, addressing the roots of the problem, and a flexible supply response, in particular on the labour market, which allowed accommodating a substantial positive external demand shock (tourism). Furthermore, the tourism-driven strong demand for Iceland's currency, the *króna*, supported an exchange rate appreciation, which helped to contain inflationary pressures. In addition, an increasing savings ratio kept import growth at bay, while the settlement of crisis-related debt helped to improve Iceland's external position. Overall, there have been many different factors contributing to Iceland's impressive recovery. Exchange rate flexibility has been only one of those, and probably not the most decisive one.

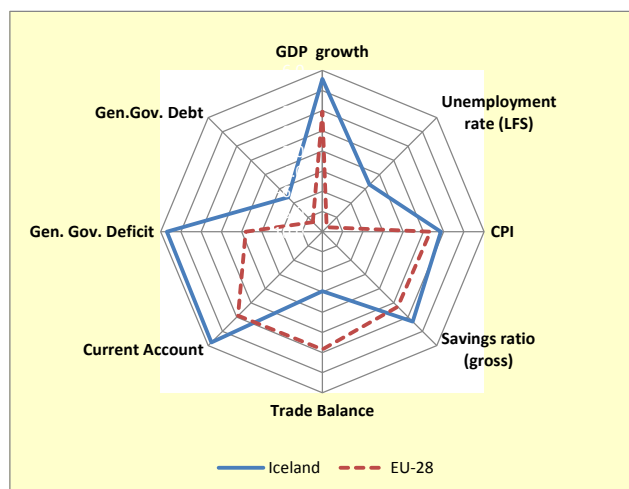
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Introduction

Currently, Iceland features an impressive combination of favourable economic indicators, such as strong growth, low inflation, low unemployment, solid public finances and sustainable external balances.

Graph 1: **Iceland's economic performance compared to EU-28*, 3-year average 2015-2017**



*) A better performance is indicated by a larger distance from the center

Source: Statistics Iceland, AMECO,

This situation is in strong contrast to 10 years ago, when Iceland was considered to be one of the economies most affected by the 2007-8 financial crisis. But the current economic performance also

compares favourably to previous boom periods, when inflation rose and external accounts deteriorated markedly. This raises questions on what might have been the main drivers behind this.

The paper aims to take a closer look at possible factors supporting Iceland's impressive recovery such as a solid crisis response by the authorities, a surge in tourism, a flexible labour supply responding to this external demand shock, a successful settlement of crisis-related debt and an increasing savings ratio. Together, these factors provided a substantial boost to Iceland's economy.

Among others, the paper also analyses the effects of Iceland's marked exchange rate fluctuations during the last 10 years and tries to assess to which extent this flexibility has helped to smoothen output fluctuations, in particular focussing on exports of goods and services (tourism), on imports and on inflation. For estimating the impact of exchange rate fluctuations on economic parameters, Vector Autoregression estimates (VAR) are used. The estimation results do not support the hypothesis of a clear and persistent positive effect of the currency's depreciation on export growth, but found a statistically significant relation with import growth and, in particular, with inflation.

The country brief covers the developments during the last ten years, i.e. the time after the outbreak of the financial crisis in late 2007, but pays particular attention to the last five years, when the economy registered an impressive economic boom.

Table 1: **Main economic indicators – Recent developments 2005-2016**

| | | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---------------------------------------|-----------------|-------|-------|-------|------|------|------|------|------|------|------|------|------|
| GDP Volume | %, year-on-year | 5.0 | 9.4 | 1.7 | -6.5 | -3.6 | 2.0 | 1.3 | 4.3 | 2.2 | 4.3 | 7.5 | 3.6 |
| Total employment (LFS) | %, year-on-year | 5.1 | 4.5 | 1.0 | -6.2 | -0.4 | 0.0 | 1.0 | 3.4 | 1.6 | 3.4 | 3.8 | 1.7 |
| Unemployment rate (LFS) | % Labour Force | 2.9 | 2.3 | 3.0 | 7.2 | 7.6 | 7.1 | 6.1 | 5.4 | 5.0 | 4.2 | 3.1 | 3.0 |
| Compensation of employees/head | %, year-on-year | 11.3 | 8.4 | 13.4 | -3.1 | 6.2 | 9.3 | 5.8 | 5.1 | 4.4 | 7.4 | 7.3 | 8.1 |
| Investment ratio | % GDP | 35.7 | 29.3 | 25.2 | 14.9 | 13.9 | 15.3 | 15.9 | 15.6 | 17.2 | 19.0 | 21.4 | 22.1 |
| Savings ratio (gross) | % GDP | 12.4 | 15.3 | 2.6 | 5.3 | 7.4 | 10.1 | 12.0 | 21.6 | 21.2 | 24.3 | 29.1 | 25.8 |
| gCPI (national index) | %, year-on-year | 6.8 | 5.0 | 12.4 | 12.0 | 5.4 | 4.0 | 5.2 | 3.9 | 2.0 | 1.6 | 1.7 | 1.8 |
| Balance of Commodity Trade | % GDP | -15.8 | -9.8 | -4.2 | 3.5 | 3.9 | 2.1 | 0.7 | 0.4 | -0.5 | -1.6 | -4.1 | -6.5 |
| Current Account | % GDP | -23.3 | -14.0 | -22.6 | -9.6 | -6.6 | -5.2 | -3.9 | 5.9 | 4.0 | 5.3 | 7.7 | 3.7 |
| General Government net lending | % GDP | 5.9 | 4.9 | -13.0 | -9.6 | -9.7 | -5.6 | -3.7 | -1.8 | -0.1 | -0.8 | 12.6 | 1.5 |
| General Government debt ratio | % GDP | 29.3 | 27.3 | 67.1 | 82.3 | 87.8 | 94.7 | 92.1 | 84.3 | 81.8 | 67.5 | 53.0 | 35.0 |

Source: Statistics Iceland

An impressive economic turn-around after a sharp crisis

The Icelandic economy had experienced a series of boom-and-bust cycles in its recent past¹, but the 2004-2008 boom-bust cycle had been one of the sharpest in Iceland's recent history. At the beginning of that period, global interest rates had been unusually low, while access to global liquidity had been easy. Furthermore, financial sector prudential rules had either been liberalised to facilitate the rapid expansion of financial market activities while remaining prudential standards were largely ignored. Iceland's banking system, which used to be dominated by 3 state-owned banks, had been privatised during 1998-2003 and followed an aggressive, carry-trade driven expansion course², resulting in banking sector liabilities reaching nearly ten times Iceland's GDP. During 2007, rolling-over maturing debt became increasingly difficult and came to a practical halt in late 2007, when the global financial crisis heavily affected interbank lending. Between January and September 2008 substantial capital outflows resulted in a depreciation of Iceland's currency by some 60%. Output fell by some 10% between the 3rd quarter of 2007 and the 3rd quarter of 2010, while the unemployment rate doubled, reaching 7.6% in 2010. In October, Iceland's 3 largest banks had to cede operation. At the end of November, the continued decline in the exchange rate forced the authorities to put in place capital controls. Largely driven by the strong depreciation, inflation more than doubled, reaching 12% in 2008 and 2009. The country's outlook on recovering from this blow in the medium-term was highly uncertain.

10 years after this economic shock, Iceland's economic situation looks very different. Output growth was nearly 4% on average during the last 5 years, while in contrast to what one might expect in such a strong growth environment, inflation remained low, falling below the Central Bank's target of 2.5% and establishing inflation

¹ For more details on Iceland's history of boom-and-bust cycles see Einarsson et al, 2015, Einarsson et al, 2016 and Einarsson, B. G., et al. (2016a).

² For more details on Iceland's banking sector, its privatisation, expansion and bust, see Johnson G. (2014)

expectations in line with this target. Real wages recovered after sharp drops during the crisis years and increased annually by 4-6% during the last 5 years, leading to substantial gains in real income. However, in contrast to the previous boom period, higher real incomes did not only translate into higher imports, but were also used to increase savings, bringing the gross savings ratio to about 25% of GDP in 2017. The labour market currently is close to full employment with unemployment rates below 3%. By 2014, public finances have been brought back to a sustainable situation. As a result, the gross debt ratio³ has fallen to below 50% of GDP by end-2017 and is expected to decline further in the coming years⁴.

Determined crisis resolution provided the base...

In the immediate aftermath of the banking sector's bust, Iceland's public finances deteriorated markedly, reflecting the effect of letting the automatic stabilisers work and the need to recapitalise and support the banking sector. In 2008, the general government deficit reached 13% of GDP, however, after registering surpluses between 4% - 6% of GDP during the boom period. In the first two years after the banking crisis, deficits remained close to 10% of GDP. By 2014, public accounts were largely balanced and – due to exceptional circumstances⁵, registered a surplus of 12.6% of GDP in 2016.

Overall, the Icelandic authorities spent some 68% of GDP for recapitalising and restructuring the banking sector, which increased the debt ratio from 27.3% of GDP in 2007 to 95.1% in 2011. In order to overcome the crisis, the authorities agreed with the IMF a 3-year Stand-by arrangement, which provided a large part of the necessary financing and which envisaged a tight fiscal policy in order to achieve a swift reduction of the countries' debt ratio. Iceland also benefitted from some bilateral financial

³ Including municipality debt

⁴ By end-September 2017, the public debt ratio stood at around 37% of GDP.

⁵ The high fiscal surplus in 2016 was largely the result of one-off factors, related to windfall revenues in the context of the liberalisation of capital controls.

support^{6,7} and from technical assistance⁸ provided by international institutions, in particular the IMF. In this context, banking sector supervision was significantly tightened and the level of prudential standards was raised substantially. Banking managers involved in unlawful activities faced jail sentences. However, Iceland's post-crisis economic stabilisation was also supported by Iceland's possibility to impose capital controls, while still benefitting from being a member to the European Economy Area, which actually requires from its members to allow an unhindered flow of capital.

During the bank restructuring process, the viable domestic banking sector has been recapitalised, while the non-viable international part has been put into receivership. In the course of the following 10 years, the banks' outstanding foreign obligations were settled, which resulted in a substantial reduction in Iceland's external imbalances⁹ and allowed to lift capital controls¹⁰ in spring 2017.

This process was facilitated by the fact that after the outbreak of the crisis most institutional foreign investors had sold their Icelandic assets on the secondary market for a fraction of the assets' face value. In order to liquidate those assets, the new owners were ready to agree to a discount in line with Iceland's payment capacities, defined by Iceland's ability to withstand a possible capital outflow, linked to allowing the withdrawal of foreign assets while maintaining a sufficient level of foreign exchange reserves.

⁶ Norway and Poland provided financial assistance in the first years after the financial crisis.

⁷ For more details concerning factors behind Iceland's impressive recovery see: Hammar (2015)

⁸ The technical assistance largely consisted in supporting the analysis of the situation and advising Iceland's authorities in drafting the necessary legislation.

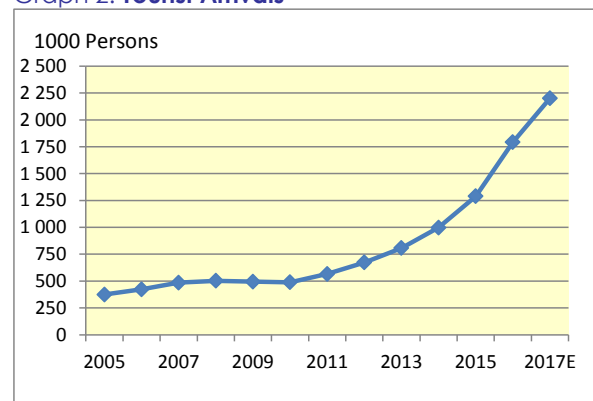
⁹ Iceland's International Investment Position (IIP) improved markedly as result of this writing-off of "hypothetical" liabilities, which dropped from a deficit of some 700% of GDP in 2008 to close to balance in 2016.

¹⁰ Although capital flows are again largely liberalised, a few safety provisions remain in place, for example entitling the Central Bank to intervene in case of capital movements which could threaten the country's economic stability.

Tourism provided a substantial boost

During the last 5 years tourism played an increasingly significant role in supporting output growth. Tourist arrivals (see graph 2), doubled during that period, reaching more than 2 million visitors in 2017, which compares to Iceland's population of just some 340 thousand persons.

Graph 2: **Tourist Arrivals***



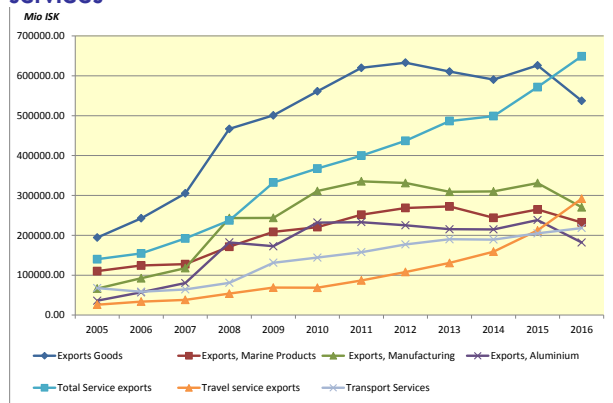
*) Inflow of tourists counted at airports, but also passengers of ferries and luxury liners, trying to take into account transit passengers. The 2017 data point only includes passengers through Keflavik airport.

Source: Icelandic Tourist Board

The main factors behind the strong increase of Iceland's popularity as tourist destination are difficult to determine. A global trend of increased tourism as a result of strong economic performance in many countries might have helped. But, there were also spectacular events, such as the eruption of a volcano (the Eyjafjallajökull) in 2010, which might have raised curiosity and the country's attractiveness for tourism. The deteriorated security situation in many traditional holiday destinations might have played a role, too. Furthermore, given the small size of the country, the numbers of incoming tourists does not need to be very high in order to represent a major inflow for the Icelandic economy.

As a result of this sharp increase, spending of tourists has become an important source of revenue. When looking at the turnover of foreign credit and debit cards as a proxy for tourist spending, tourist purchases rose from less than 2% of GDP in 2005 to nearly 10% of GDP in 2016.

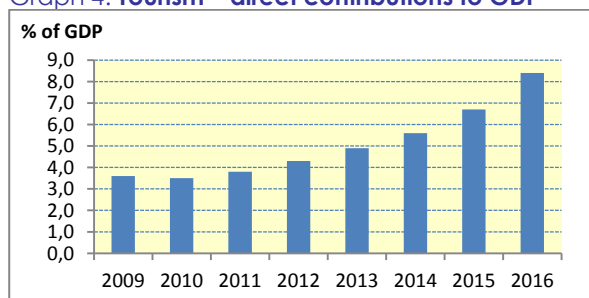
Graph 3: Export revenues of selected goods and services



Source: Statistics Iceland

Also in terms of foreign exchange earnings, tourism has become a key sector, outperforming the traditional foreign exchange earning sectors of fish and aluminium. Foreign exchange earnings from travel services¹¹ increased from 8% of total export earnings in 2005, to nearly 25% in 2016. Thus tourism is currently the largest source of foreign revenue, compared to aluminium (accounting for 23% of total export earnings), and marine products (20% of total export earnings).

Graph 4: Tourism – direct contributions to GDP



Source: Statistics Iceland

The strong demand push through tourism had also knock-on effects on other areas of Iceland's economy, in particular the construction and transport sectors, which recently experienced a substantial boost in terms of output and employment. However, as tourist consumption usually includes a relatively high share of imported commodities, the actual

¹¹ Excluding transport services

impact on the economy might be lower than in the case of the other two export categories¹². Recent estimates¹³ on the sector's direct contribution to GDP point to a sharp rise to nearly 9% of GDP in 2016, compared to some 3.5% of GDP in 2009¹⁴.

The Icelandic authorities are optimistic that a significant role of tourism could be maintained, although the current annual increases are not likely to be sustainable. This assessment is supported by increasing interest in the rapidly growing consumer markets of Central and Eastern Asia for Iceland as tourist destination. However, even in the absence of the tourism boost, the more traditional sources of growth would remain, leaving Iceland at a growth trajectory closer to its long-term average of around 2.5%.

However, there have also been negative side effects to the recent boom in tourism: The strong demand for the islandic *króna* probably contributed to the marked appreciation of the islandic currency after 2013. This helped to contain inflationary pressures. However, some export-oriented industries, such as the nascent IT services, have started to complain about losing price competitiveness due to the high wage level and the strength of the currency.

Furthermore, as a result of the strong demand for tourist accommodation, housing prices in the capital have been increasing sharply. There is increasing evidence of crowding-out effects in the real estate sector, for example, making it more difficult for young families to find affordable housing in the capital area.

In the aftermath of the Eyjafjallajökull's eruption in 2010, the Icelandic authorities tried to support the promotion of Iceland as a tourist destination. In the meantime, the focus of Iceland's authorities has been shifting towards better channelling tourism flows across the country but also during the year, in order to distribute the demand pressure more evenly.

¹² For a recent estimate of the import content of tourist consumption see Orsini (2017).

¹³ Statistics Iceland (2017)

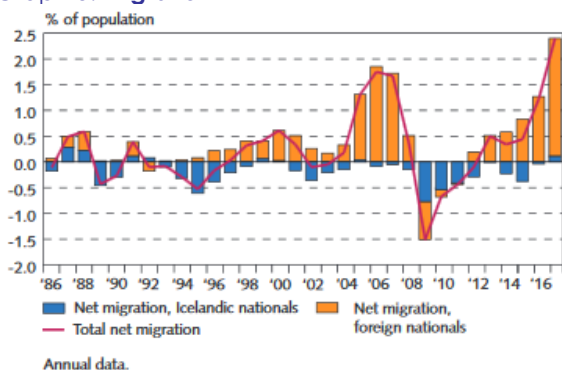
¹⁴ These estimates do not include indirect effects, such as employment generated through tourism related construction.

Furthermore, the authorities have stepped up efforts to support the construction of touristic infrastructure.

A flexible labour supply (largely from abroad) helped to accommodate the external demand shock

Faced with a substantial external demand shock, Iceland benefitted from a flexible labour supply, not only from domestic sources, but in particular from abroad. Iceland's membership to the European Economic Area facilitated access to the European labour market in order to meet the additional demand. This flexibility also had helped to smoothen labour market tensions during the negative employment shock during the crisis years, when many Icelanders resorted to an Icelandic tradition

Graph 5: **Migration**



Source: Statistics Iceland, Central Bank of Iceland

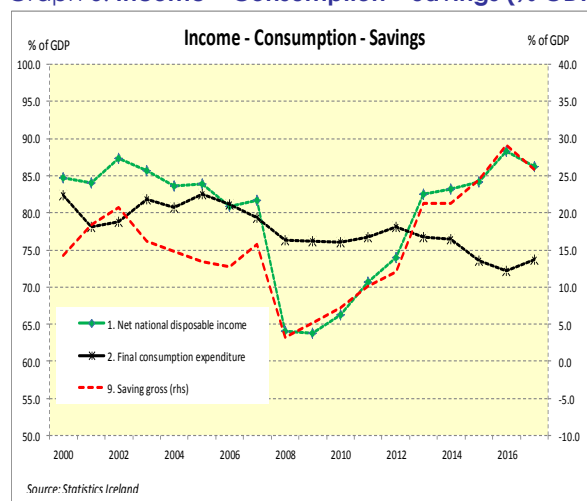
during crisis times of looking for employment abroad, in particular in neighbouring Scandinavian countries, such as Norway.

In contrast to previous booms, this time a rising saving ratio helped to contain a worsening in the external balance

During the previous boom period, the gross savings rate had dropped from 20.8% of GDP in 2002 to

15.8% in 2007, financing a relatively high level of consumption. With the outbreak of the crisis in

Graph 6: **Income – Consumption – Savings (% GDP)**



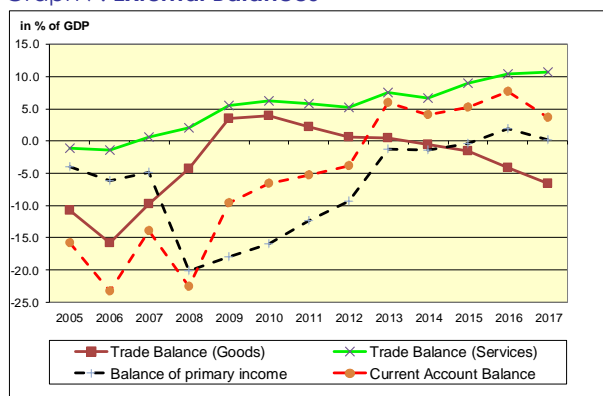
Source: Statistics Iceland

2008, the savings ratio dropped sharply, which allowed a smoothening of the consumption level, despite a drastic drop in disposable income. Since then, the savings ratio has remained in line with the income development, i.e., it continued to increase together with disposable income, while leaving consumption largely stable as a percentage of GDP. This pattern continued during the last 4 years of strong growth, while private consumption as a share of GDP even declined.

Important factors for this change in behaviour might have been still fresh memories from the latest boom-bust cycle, or the need to accumulate higher savings in order to be able to finance the rapidly increasing costs of real estate, like housing. Furthermore, a tight counter-cyclical monetary policy maintains a relatively high real interest rate, which could have encouraged higher savings. Also, in the aftermath of the banking crisis and due to stricter prudential rules, banks probably were more cautious in their lending approach.

This consumption constraint definitely helped to reduce pressures on domestic demand and imports, relieving the trade account, which, in contrast to the previous boom, registered largely balanced accounts

Graph 7: **External Balances**



Source: Statistics Iceland

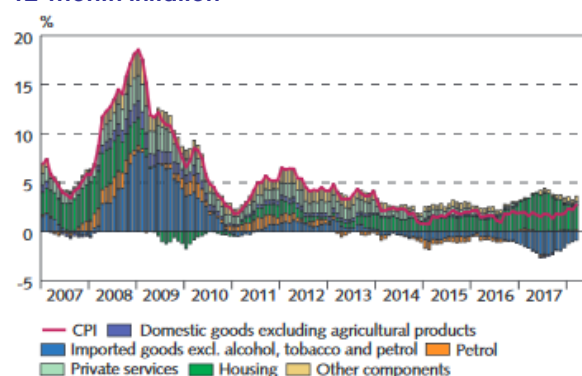
during the initial years of the boom. However, during 2017, strongly increasing imports started to widen the deficit again, reaching by September 5.6% of GDP. During the previous boom, trade deficits had been above 10% of GDP.

Low import prices and a strengthening currency have helped to dampen inflationary pressures

Despite strong output growth, headline inflation has remained below expectations during recent years. Even nominal wage increases of some 6%-8% appear to have had only a limited effect on headline inflation rates. This might be explained by the limited role, which wages play in affecting headline inflation figures, in particular when compared to the effect of imported prices.

As can be seen in graph 8, from mid-2014 onwards, lower prices for imported commodities, which account for 30% of the indicator's basket, reduced headline inflation, by at least 1 percentage point from early 2015 onwards. This effect became even larger in the first half of 2017, when the currency's appreciation had a stronger effect on import prices. As a result, for probably the first time in Iceland's post-war history, inflationary expectations registered a clear downward trend.

Graph 8: **Contribution of individual components to 12-month inflation**



Source: Statistics Iceland, Central Bank of Iceland

Excursus: The effect of Iceland's exchange rate on growth and prices

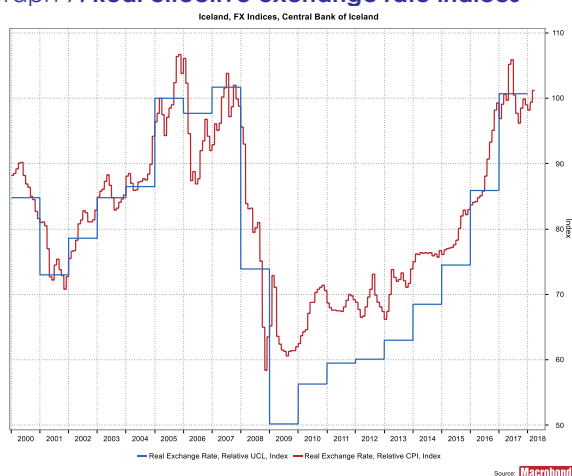
In the aftermath of Iceland's banking crisis, there was a lively academic discussion¹⁵ on why Iceland's economy appeared to perform better than many other countries, which had also been hit by the global financial crisis. One prominent argument was to point to the sharp depreciation of the Icelandic *króna* in 2008 as a key factor for this better economic performance. This argument is based on textbook economics, according to which a lower exchange rate improves a country's price competitiveness and thus increases external demand, which helps to kick-start an ailing economy.

In order to test this hypothesis, we used vector autoregression estimates (covering the period January 2000 – March 2017) and assessed the main factors affecting Iceland's exports (of goods and tourist arrivals). Among others, a possible statistical effect of exchange rate fluctuations on Iceland's exports of goods and services, but also on imports and inflation has been analysed.

¹⁵ For example, see Krugman (2015).

Iceland introduced a floating exchange rate regime and inflation targeting in 2001. Since then the exchange rate experienced substantial fluctuations and there have been recurring discussions on the benefits and costs of this approach¹⁶. During the banking boom (starting at around 2000 and coming to an end in 2007), the real effective exchange rate appreciated substantially, reflecting significant capital inflows. However, in late 2007, the erupting banking crisis led to strong capital outflows, resulting in a drop in the currency's value by nearly 60% the first nine months of 2008 and further in October and November 2008. The sharp decline was only brought to a halt by the introduction of capital controls, preventing capital outflows, but allowing trade related transactions. From 2009 onwards, the real effective exchange rate appreciated again at an accelerating pace, reaching pre-crisis levels in late 2016.

Graph 9: **Real effective exchange rate indices**



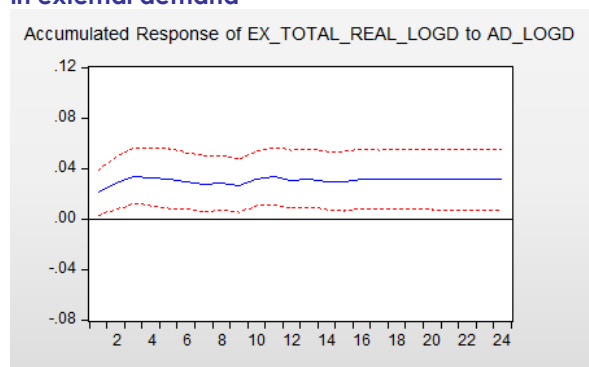
Source: Central Bank of Iceland

¹⁶ For more details see Daniélsson (2012), or Central Bank of Iceland (2017).

Iceland's trade determinants: Empirical results

Goods exports appear to be influenced by external demand and domestic production. The latter is especially significant when looking only at aluminium exports which can be explained by the opening of new aluminium production facilities in the period after the crisis.

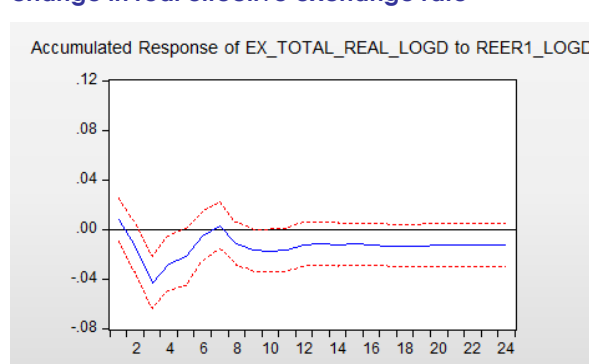
Figure 1: **Impulse response function of exports to rise in external demand**



The relationship between goods exports and changes of the REER is weaker. It is only significant in the third period after the shock. Therefore we can conclude that real effective exchange rate movements have only short lived effects on goods exports.

The rise of tourism coincided with the strong appreciation of the Krona so we can conclude that other factors than prices were the main drivers of

Figure 2: **Impulse response function of exports to change in real effective exchange rate**



tourism, namely strong external demand.

Direct pass through of exchange rate shocks to imports and prices is significant and its direction is in line with theory. It is worth noting the speed of the pass through. After one year, almost two thirds of the overall impact of exchange rate shocks on imports and inflation has already been materialised. Effects remain statistically significant even after 20 quarters.

Figure 3: Impulse response function of tourism arrivals to changes in REER

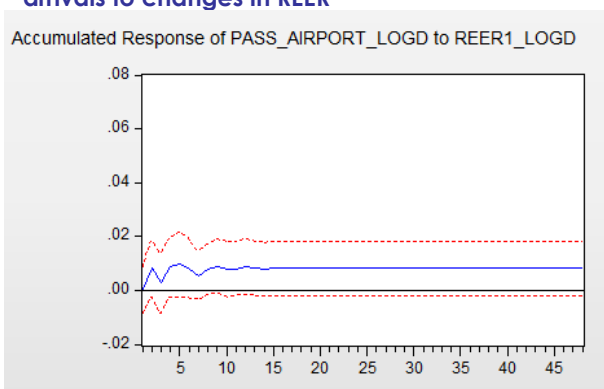


Figure 4: Impulse response function of imports of goods and services to changes in NEER

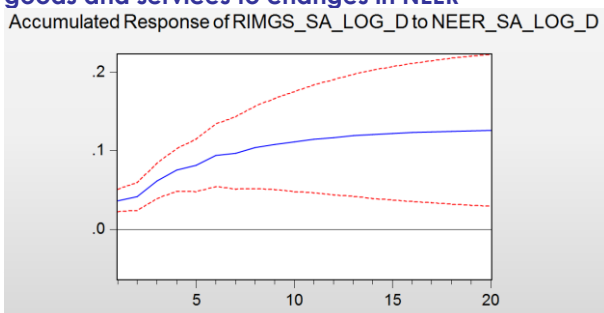
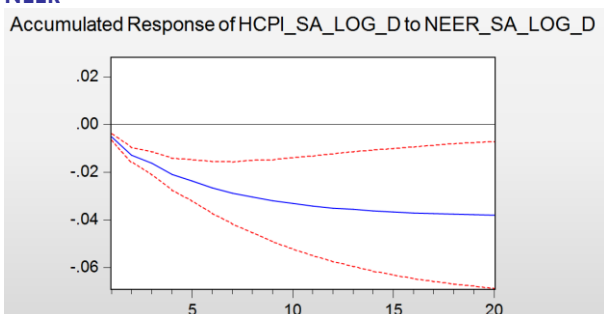


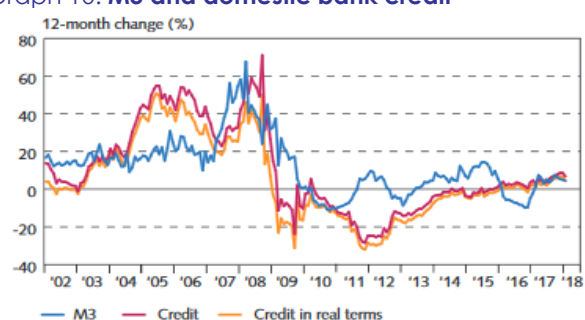
Figure 5: Impulse response function of inflation to NEER



Is there a new bust in the making?

Many aspects of the current boom look very similar to previous upswings, which often collapsed into a sharp recession afterwards. Output growth has been clearly above potential in recent years, real wages rose by 4-6% annually. Some sectors are confronted with labour shortages, and real estate prices have risen sharply in some regions, in particular the capital area. Thus, there are signs of overheating, in particular in areas related to tourism. Is there a risk of a bubble, which might burst soon?

Graph 10: M3 and domestic bank credit



Loans are assessed at claim value. The series "credit in real terms" represents loans deflated by the CPI. Changes have been made to loan classification during the period shown. The data are therefore not fully comparable within the period. Further information can be found on the monetary statistics pages of the Central Bank website. Data from October 2008 are preliminary. Monthly data. Sources: Statistics Iceland, Central Bank of Iceland.

Source: Central Bank of Iceland

Of course, there is always the possibility of unforeseen external events bringing the current economic boom to an abrupt end. Possible scenarios in this respect could be the outbreak of an international crisis leading to a significant drop in incoming tourism, or a sudden disappearance of fish stock in the Northern Atlantic, or a drastic drop in prices for aluminium, or simply another volcanic eruption, disrupting transport links with Iceland and heavily affecting economic activities on the island. Capital flows, which triggered substantial imbalances during the last boom-bust cycle, have been liberalised again. However, the underlying legislation includes security provisions allowing the Central Bank to intervene in case of disruptive capital flows, endangering economic stability. Concerning domestic risks, the current situation appears more assuring than in previous boom periods. The current boom is mainly a result of foreign demand and so far has not yet translated into major domestic imbalances. Credit growth has been

negative during most of the time since 2010 and only picked up recently, reaching 7.8% year-on-year growth at the end of 2017. Household debt has declined since the banking crisis, standing at 77% of GDP at the end of 2017, compared to a peak of 124% of GDP end of 2009. Corporate debt shows a similar profile of a continued decline, reaching 88% of GDP end of 2017, coming down from a peak of 230% of GDP at the end of 2008.

Furthermore, there are signs of a cooling-off of the tourism driven boom. The number of incoming tourist and overnight-stays increases at lower rates, and also the demand for real estate and rental prices is slowing down. For example, in the capital region, the house price index rose by only 1.8% in the second half of 2017, while in the first half, price increases still had been over 13%. In November 2017, the index of rental prices registered a decline by 0.7%, which happened for the first time since 2015.

Summary and Conclusions

Iceland's economy is currently in a peculiar position, combining high growth and a strong fiscal performance with low inflation and current account surpluses. This favourable mix of economic indicators is largely the result of a number of different factors. Strong reform ownership in the aftermath of the crisis, a significant fiscal effort to restructure and recapitalise the domestic banking sector, and responsible fiscal and monetary policy laid the ground for a swift normalisation of the economic situation after the post-2008 crisis mode. The government's recovery efforts were strongly supported by an unprecedented boom in incoming tourism. A flexible supply of (mainly foreign) labour allowed the Icelandic economy to accommodate the additional demand without running into immediate supply constraints. The resulting stronger demand for Iceland's currency supported the *króna*'s appreciation, which – together with low oil prices - helped to contain inflationary pressures. Another supportive factor was a change in the behaviour of households and companies, which instead of using higher disposable income for consumption and imports, decided to increase savings. This helped to contain import growth and thus to keep the widening of the trade deficit under control. Furthermore, the

authorities managed to agree with the owners of foreign owned debt on a settlement which was in line with Iceland's payment capacities. This significantly reduced Iceland's external debt and allowed the lifting of capital controls.

However, there have also been negative side effects to the recent boom in tourism: Due to the strong demand for tourist accommodation, housing prices have been increasing sharply and there is evidence of crowding-out effects in the real-estate sector, for example, making it more difficult for young families to find affordable housing in the capital area. Furthermore, the strong demand for the islandic *króna* probably contributed to the recent marked appreciation of the islandic currency, which also appears to impede price competitiveness for other export-oriented sectors, such as IT services.

As far as the role of Iceland's exchange rate is concerned, the paper's estimations point to only a limited role in explaining the current favourable mix of economic indicators. Technical and natural constraints for expanding the production of Iceland's key export commodities (aluminium and fish) prevented Iceland from taking advantage from the currency depreciation during the crisis. Fortunately, tourism demand appears to have been mainly driven by non-price related factors. On the other hand, due to the high import dependence of Iceland's economy, the currency's depreciation immediately translated into higher inflation, eroding real disposable income and contributing to the drastic downward adjustment in output in the aftermath of the 2008-9 crisis.

After the rapid increase in tourist inflows during recent years, there are first signs of a loosening momentum. In contrast to previous boom-bust cycles, domestic imbalances have remained limited to largely tourism-related sectors, like housing and real estate prices, while the balances of the banking sector and of household are still solid. In absence of unforeseeable external shocks, a smooth landing thus appears more likely than another bust.

Nevertheless, the Icelandic authorities are facing important policy challenges, related to better integrating the strong rise of tourism into Iceland's economy, avoiding overheating but also supporting a further economic diversification.

Annex 1:

The following section is presenting the results of a number of empirical estimations, testing whether exchange rate fluctuations had a significant effect on exports of goods and tourism, but also on domestic variables, such as imports of goods and services, but also inflation and output growth.

The effects of the exchange rate on goods exports and tourism

Using an unrestricted VAR estimate, the relationship between exports of goods and tourist services and the real effective exchange rate and external demand has been estimated. As Iceland's goods exports structure is dominated by aluminium and marine products, a domestic production series has been added to the otherwise standard export model. The estimated models are thus:

Goods exports model:

$$X_t = c + \alpha D_t + \sum_{i=1}^p A_i X_{t-i} + u_t \quad , X_t = \{ExtD, DomPr, REER, GoodsExp\}$$

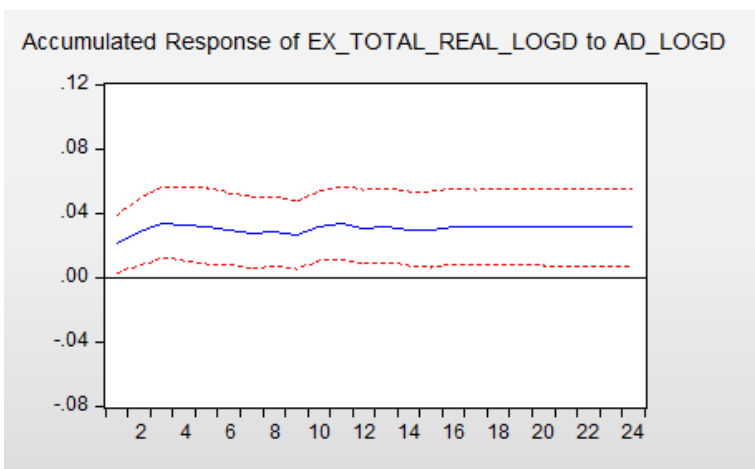
Tourism model:

$$Y_t = c + \alpha D_t + \sum_{i=1}^p A_i Y_{t-i} + v_t \quad , Y_t = \{EU_retail, REER, Arrival/OStays\}$$

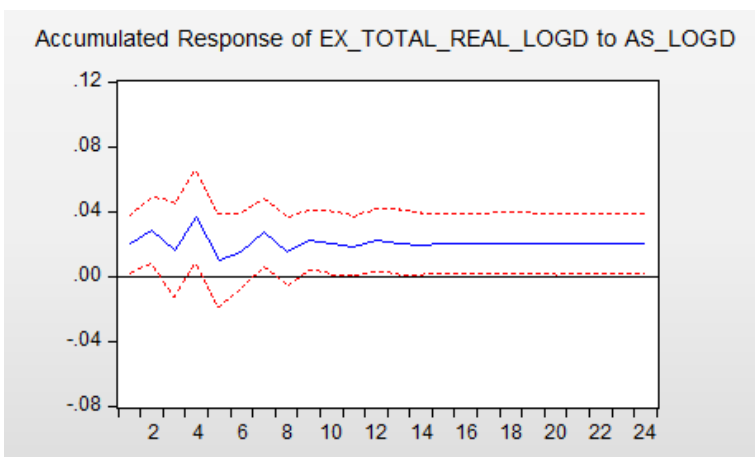
Where c is a constant; D_t is a crisis dummy variable; $ExtD$ is external demand which we model using a weighted average of ESTAT's EU retail and industrial turnover indices; $DomPr$ is domestic production proxy i.e. a weighted average of domestic aluminium and fish production; $REER$ is the real effective exchange rate index; $GoodsExp$ is total goods exports; EU_retail is the EU retail turnover index; $Arrival/OStays$ are the tourist overnight stays or arrivals at the Keflavik airport; and u_t and v_t are reduced form innovation vectors. We use monthly data from Statistics Iceland, the Central Bank of Iceland and ESTAT, for the period January 2000 to March 2017. All data series are seasonally adjusted and, where necessary, nominal values are deflated using Iceland's HCPI index. To ensure that all variables are stationary all series were log-diff transformed. To obtain the appropriate lag length we used the AIC lag length criterion. We used Choleski decomposition to obtain a recursive system of variables and completely identify the structural VAR. The ordering of variables used is $ExtD$, $DomPr$, $REER$, $GoodsExp$ and U_retail , $REER$, $Arrival/OStays$. We assume that external demand is not influenced contemporaneously by any of the other variables. Domestic production reacts to changes in external demand and influences the $REER$ which is a determinant of exports. External demand also directly contributes to movements of $REER$ and exports/tourist visits.

Results:

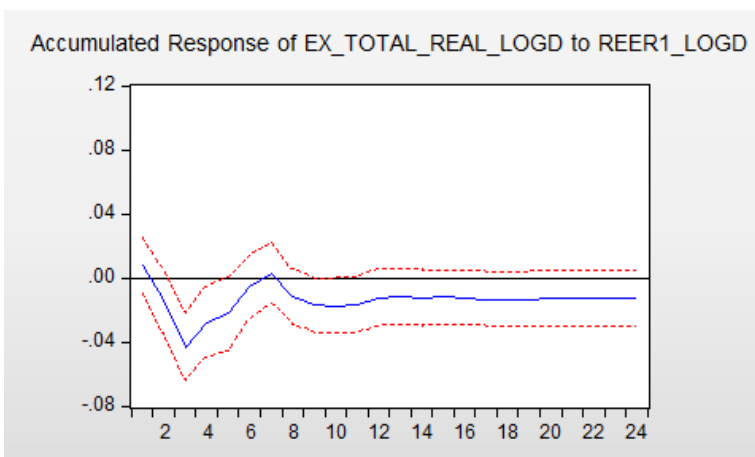
Figure 6: **Goods exports impulse response function**



The effect of external demand on goods exports is positive and statistically significant throughout the forecasting period.

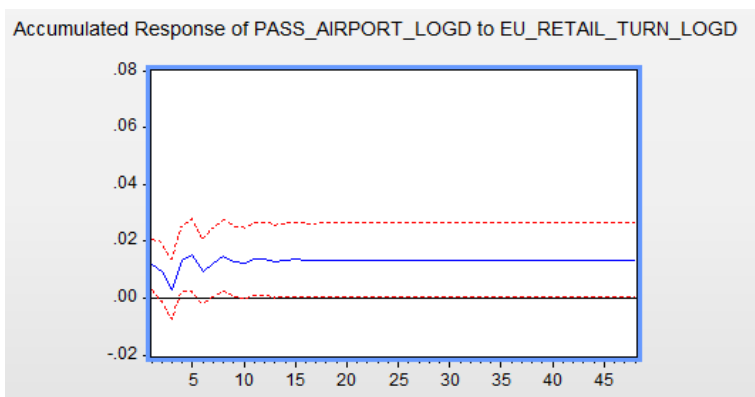


The effect of domestic production on goods exports is positive and mostly statistically significant. The relationship is especially strong when looking only at aluminium production/exports and less so for marine products. The relationship is probably explained by the opening of new aluminium production facilities in the immediate aftermath of the crisis

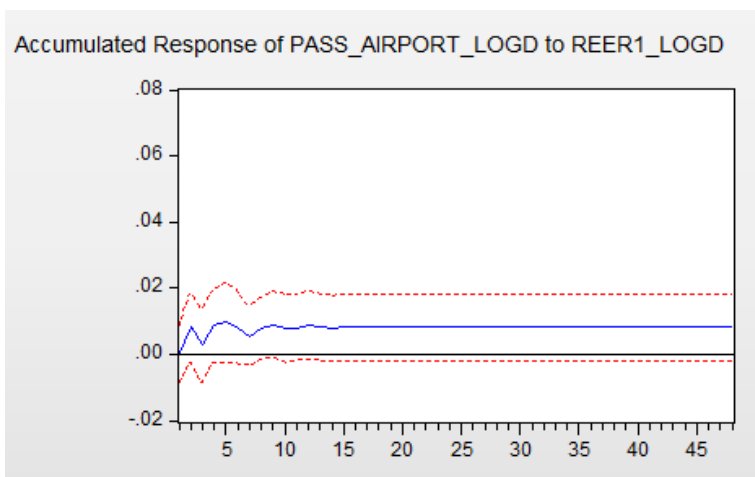


The relationship between goods exports and changes of the REER is weaker. It is only significant in the third period after the shock. Therefore we can conclude that real effective exchange rate movements have only short lived effects on goods exports.

Figure 7: **Tourist arrivals impulse response functions**



Airport arrivals in Iceland used as a proxy for tourist arrivals show a positive and statistically significant relationship to retail turnover in the EU, a proxy for external demand.



Changes in the real effective exchange rate do not have a statistically significant effect on tourist arrivals in Iceland. Given that Iceland is still a relatively new tourist destination, relative price changes do not seem to have effect on tourism.

These very basic estimates do not support the hypothesis of an exchange rate (depreciation) driven recovery. The results of those estimations suggest that Iceland's export performance is to a large extent determined by demand shifts in Iceland's main trading partners. Changes in the real effective exchange rate seem to affect goods exports only temporarily¹⁷. This might be due to the size and composition of Iceland's exports. For example, the supply of fish is limited by fishing quotas and available fish stock, while the production and export of aluminium has been mainly constrained by available production capacities, which in the case of Iceland have been operating at full capacity for years. Therefore, significant changes in the real effective exchange rate appear to have no significant impact on goods exports or incoming tourism.

¹⁷ These findings are in line with research done by the Central Bank of Iceland, for example: Danielsson et al. (2012) and Tsangarides, C. (2010).

The effects of the exchange rate on goods and services imports, inflation and output

Similar to above, we try to estimate the impact of the effective exchange rate fluctuations on imports and domestic demand. As a small economy with a limited range of production possibilities, Iceland imports a wide range of agricultural, manufactured and capital goods. However, imports dropped sharply following the outbreak of the crisis, which helped to reduce the substantial trade deficit during the boom period. Furthermore, given Iceland's high share of imports in consumption and investment, the effect of exchange rate fluctuations on Iceland's price dynamics is tested.

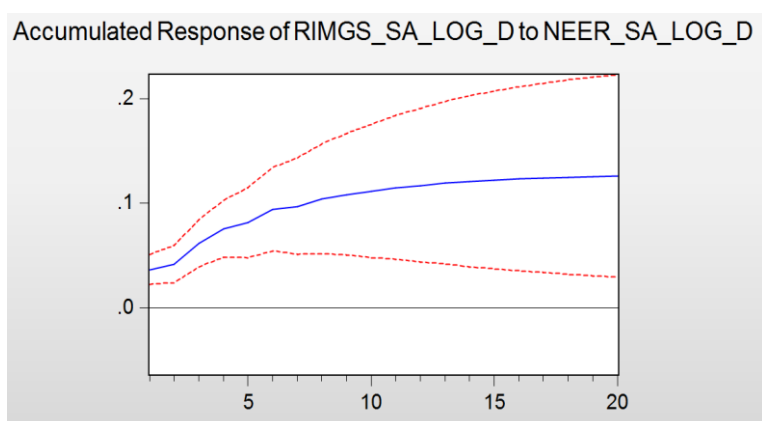
To estimate the impact of the real effective exchange rate fluctuations on imports, domestic demand and inflation we use a VAR model based on the exchange rate channel of the monetary transmission mechanism.

$$Z_t = c + \sum_{i=1}^p A_i Z_{t-i} + w_t, \quad Z_t = \{NEER, EX, IM, Inf, Y\}$$

Where c is a constant; NEER is the real effective exchange rate index; EX is Iceland's exports; IM is Iceland's imports; Inf is the Iceland's harmonised consumer price index; Y is the real GDP growth; and w_t is a reduced form innovation vector. We use quarterly data from Statistics Iceland and the Central Bank of Iceland, for the period Q1 1997 to Q1 2017. All data series are seasonally adjusted and, where necessary, nominal values are deflated using Iceland's HCPI index. To ensure that all variables are stationary all series were log-diff transformed. To obtain the appropriate lag length we used the AIC lag length criterion. We used a Choleski decomposition to obtain a recursive system of variables and completely identify the structural VAR. The ordering of variables used is NEER, EX, IM, Inf, Y. Here we assume that the exchange rate fluctuations are resulting from monetary policy changes and are not influenced contemporaneously by any of the other variables. Net trade reacts to changes in relative prices and influences the price level contemporaneously (i.e. a direct exchange rate pass-through effect). We further assume that the changes to the output gap (GDP) have no contemporaneous effect on inflation (i.e. indirect exchange rate pass-through effect on inflation).

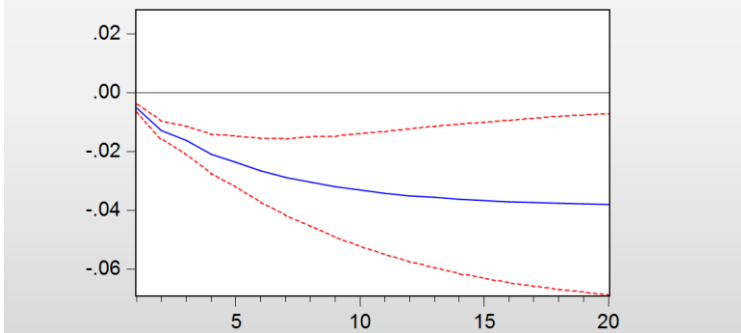
Results:

Figure 8: **Goods and services imports and inflation impulse response functions and variance decompositions**



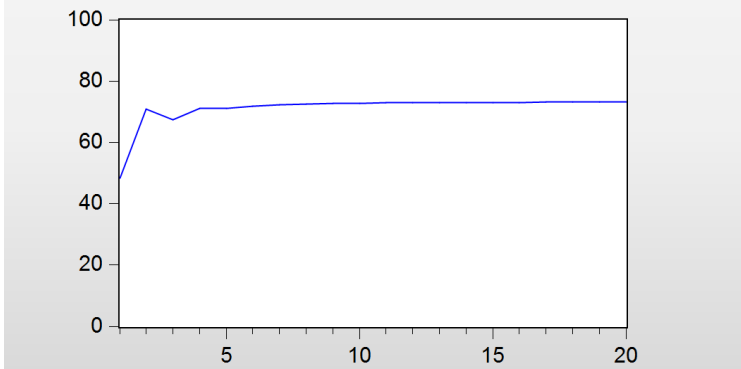
The relationship between goods and services imports and changes of the NEER is positive and significant. Imports seem to be more sensitive to exchange rate movements than exports. This is explained by a series of currency boom bust cycles which have traditionally accompanied the overall economic cycle in Iceland.

Accumulated Response of HCPI_SA_LOG_D to NEER_SA_LOG_D



Inflation is significantly negatively affected by currency appreciation. Furthermore movements in the nominal effective exchange rate explain around 70% of variance in the inflation. These results reflect Iceland's reliance on imported consumer and investment goods.¹⁸

Percent HCPI_SA_LOG_D variance due to NEER_SA_LOG_D



¹⁸ These findings are in line with similar research, such as Asgeirsson G. O. (2011), or Petursson Th.G. (2010).

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