



# ECONOMIC AFFAIRS

## Indexation and monetary policy

*Ásgeir Danielsson*

Indexation, fixed interest rates, and amortised payments are characteristics of long-term loans in Iceland. This paper explores whether this combination of features weakens monetary policy. The specified features do not reduce the impact of the policy rate on long-term rates; however, they do cause a reduction in reinvestment, which means that new loans constitute a lower percentage of the total loan stock, particularly if inflation rises. If monetary policy is transmitted through the magnitude of new loans, it is more effective in a system featuring nominal interest rates and equal-installment payments.

Published by:

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Vol. 1, February 2009

Online

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In *Economic Affairs*, ð is transliterated as d and þ as th in personal names, for consistency with international references, but otherwise the Icelandic letters are retained.

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- Nil.

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## Indexation and monetary policy

The paper explores whether the characteristics of long-term loans in Iceland – indexation, fixed interest rates, and amortised payments – cause monetary policy to be less effective here than in other countries. Studies carried out by foreign economists show that the policy interest rate often has a limited effect on long-term interest rates, which tend to be determined more by global interest rates. This weakens monetary policy. It has not been shown that the impact of the policy rate on long-term interest rates is less in Iceland than in other countries, nor has it been demonstrated that indexation is important in this context.

Fixed interest rates have a different type of effect on supply and demand for credit than variable interest rates do. This difference can be significant for monetary policy effectiveness if the policy rate is wielded so that real interest rates vary directly with inflation.

Equity and payments vary greatly over time, depending on whether the loans concerned are indexed and amortised or are equal-installment loans. New loans constitute a higher percentage of total lending in the latter system, and this percentage varies directly with inflation. If monetary policy primarily affects the supply of new loans, this could explain the difference in monetary policy effectiveness.

### Introduction

A comparison of the results of monetary policy in Iceland since 2001 with those of other inflation-targeting nations reveals that Iceland's performance is rather poor. It is natural that a search for the causes of this should focus on the distinctive characteristics of the Icelandic economy, among them its small size, the size of the external shocks to which it is exposed, and exchange rate pass-through.<sup>2</sup> It has also been noted that indexation of financial obligations is more common in Iceland than it is elsewhere. For some reason, indexation has been more often in the crosshairs of critics than have other characteristics of long-term loans in Iceland, which commonly feature fixed interest rates (actually, fixed real interest rates), while loans in neighbouring countries often have variable (nominal) rates.<sup>3</sup> Furthermore, the vast majority of mortgage loans are amortised, so that instalments are lowest first but increase as the loan approaches maturity.

Those who point out these characteristics of the Icelandic credit market tend to cite indexation both as the reason short-term interest rates – which are directly affected by the Central Bank's policy rate –

1. The author would like to thank Arnór Sighvatsson, Thórarinn G. Pétursson, Rannveig Sigurdardóttir, and Markús Möller for their constructive comments.

2. Various aspects of these issues are discussed in K. Honjo and B. Hunt (2006), Arnór Sighvatsson (2007), and Thórarinn G. Pétursson (2008).

3. Information on the proportion of fixed- and variable-rate loans extended to households in OECD nations can be found in Girouard *et al.* (2007), which also contains other interesting information on household debt. Iceland was not included in the study.

do not affect long-term rates, and as the reason monetary policy is less effective in Iceland than in neighbouring countries that have successfully followed an inflation-targeting regime in recent years. This paper attempts to shed light on this topic.<sup>4</sup> First, however, it presents an overview of the extensive discussion among foreign economists of the advantages and disadvantages of indexation.

## Indexation from the viewpoint of economics

Economics assumes that people make decisions based on a rational evaluation of the options available to them. In general, it is also assumed that people do not allow themselves to be confused by the monetary value of goods during inflationary periods but consider instead their real value. A wage increase of 5% is not a real increase if inflation is 10%. Similarly, interest rates are not high or low in and of themselves, but only as they compare to inflation. An interest rate of 10% is high if inflation is 2% but low if inflation is 9%.

Because financial obligations involve the future, market expectations play a major role in interest rate formation. Inflation expectations affect nominal interest rates if loans are not indexed. It is commonly assumed that nominal interest rates ( $v$ ) are composed of real interest rates ( $r$ ), inflation expectations ( $dp^e$ ), and a risk premium due to the uncertainty about inflation ( $c$ ), so that the following equation applies:<sup>5</sup>

$$v = r + dp^e + c$$

Other things being equal, nominal interest rates increase as inflation expectations rise. If uncertainty about future developments in interest rates and inflation escalates, nominal interest rates increase as well, due to rising risk premia.

If the loan is indexed, the formula changes so that nominal interest rates are expressed as follows:

$$v' = r + dp$$

where  $dp$  is headline inflation according to the indexation provision of the loan agreement.

If inflation is not systematically misforecast, expected inflation should, on average, equal headline inflation ( $dp^e = dp$ ). Less risk incurred by the borrower (inflation can also prove lower than expected) could possibly stimulate demand for credit and press real interest rates upward. According to this, indexation of loans is advantageous because it allows both borrowers and lenders to protect themselves against uncertainty about future price level developments.

The risk due to inflation is determined by the level of uncertainty about inflation developments. In general, this uncertainty rises in tandem with inflation. It also increases with lengthening loan maturities. Therefore, because inflation must be considered, business contracts

4. Many of these points are covered in depth in the Central Bank report to the Ministry of Commerce (2003). Most of the findings in the present paper are similar to those in that report.

5. Actually, this formula is a bit more complicated:  $v = (1+r)(1+dp^e)(1+c)-1$ . If inflation is low, the formula in the text gives results that are very nearly accurate. The simplification has no effect on the results.

are concluded for short periods of time or contain various types of review clauses, both of which increase the cost of concluding the contract. One way to reduce this cost is to add an indexation clause; that is, a general rule governing how provisions shall change in response to price level developments. This applies, of course, to wage agreements, sales agreements, and taxes, as well as loan agreements. Indeed, indexation clauses can be found in such agreements in numerous countries. Because it is advantageous that some types of loans (for example, residential mortgages) should be taken for very long periods – much longer than other types of agreements – the benefits of eliminating the uncertainty due to inflation are greatest in such cases.<sup>6</sup> In many countries with a history of high inflation – such as Iceland – indexation has been a prerequisite for the development of a long-term credit market.<sup>7</sup> It is no coincidence that, while long-term loan agreements bearing a nominal interest rate can be found in Iceland, all loan agreements with a term longer than 20 years are indexed. It is quite likely that short-term indexed agreements would exist as well if they were not prohibited by law.<sup>8</sup>

The arguments in favour of indexation as protection against uncertainty about inflation are based on the assumption that the price index used to measure inflation is reasonably accurate. The most common criticism of indexation is that no price index is absolutely correct and that, in many instances, it is possible to introduce methodological changes (for example, as regards the treatment of interest in housing cost calculations) that affect the calculation of the index. It is not clear, however, that it is possible to avoid using some price index as a reference when preparing loan agreements, even though the index is not actually written into the contract. In other Northern European countries, nominal interest rates are frequently determined with consideration for expected inflation as it is measured using some price index that is, of course, imperfect.

Throughout history, various theories have been advanced to explain the interplay between indexation and inflation. Indexation is more common in economies characterised by high inflation. This could be interpreted to mean that indexation is inflationary, but it should also be noted that the advantages of indexation are greater in economies where uncertainty about inflation is greater; therefore, it is appropriate that indexation should be more common in those economies.

6. In their research, John Campbell and Joao Cocco (2003) found that indexed mortgage loans are more beneficial than other types of housing loans from the standpoint of risk diversification. Jón Steinsson summarises the principal findings in their paper in an article on his website: [www.columbia.edu/~js3204/greinar/D06verdryggingergod.pdf](http://www.columbia.edu/~js3204/greinar/D06verdryggingergod.pdf).

7. In the paper by Portes and Baldursson (2007), the authors assert (on p. 3) that indexation of financial obligations dilutes the effect of monetary policy in controlling inflation. They point out, however, that “financial indexation proved highly successful in restoring the stock of financial savings” in Iceland (p. 10) after the crisis of the 1970s. This restoration of financial savings must be important for the effectiveness of monetary policy in controlling inflation.

8. In 1995, the government then in power issued an announcement in connection with wage settlements, stating that indexation would be reduced in stages. This was done, and as of January 1, 1998, indexation was prohibited on loans with a term shorter than five years and deposits of less than three years’ duration. The announcement provided for further restrictions on indexation of loans, but those plans were abandoned, in part at the urging of the Central Bank. These matters are covered in the Central Bank report to the Ministry of Commerce (2003).

Indexation was discussed widely in the 1970s and 1980s, when inflation was a serious problem in Western countries, and many of the world's foremost economists took part in the discussions at the time. The main conclusion was that indexation had a positive effect under certain circumstances and a negative effect under others. If it is efficient to keep relative prices fixed, it is beneficial to have indexation that guarantees that the price in question remains fixed in proportion to the general price level, but if it becomes efficient that relative prices should change, keeping them fixed via indexation is detrimental. Friedman (1974), for example, pointed out that wage indexation dilutes the effects of a contraction in money supply on GDP because a contraction in money supply leads to a drop in nominal wages in a deflationary period, while real wages remain unchanged if wages are indexed. As a result, labour demand and production decline less than they would otherwise. Fischer (1977) pointed out that, although this is certainly correct, wage indexation would be detrimental if the economy suffered a negative production shock requiring a reduction in real wages. Under such circumstances, Fischer said, indexation could lead to higher inflation and a more severe contraction than would otherwise occur. This analysis assumes that the parties will not renegotiate indexed wages when the economy suffers a shock; furthermore, it assumes that it is not possible to reduce nominal wages in deflationary periods.

Fischer (1981) examined data on indexation in numerous countries and studied its relation to inflation using regression analysis. He concluded that there is no correlation between inflation and indexation of wages, taxes, insurance benefits, or investments; however, he did find a correlation between inflation and indexation of bonds. Fischer's findings show that inflation is generally higher in countries where bonds are indexed. The findings do not address the subject of cause and effect, and it is conceivable that, as has been mentioned previously, market agents are more likely to prefer index-linked bonds in high-inflation countries.

During this period, economists also examined advantageous composition of fiscal debt and showed that it would be beneficial to finance at least a portion of that debt with indexed government bonds. Fischer (1977b) searched for rational explanations for the lack of indexed corporate bonds in the United States. He deemed the theories previously advanced as explanations of this phenomenon rather implausible and considered it highly likely that corporations would begin to issue indexed bonds in the near future. In many nations, the public sector issues indexed government bonds, which are considered a normal part of the financial markets; furthermore, a comparison of the yields of comparable indexed and nominal bonds provides important indications of investors' inflation expectations.

## The effect of short-term interest rates on long-term rates

A number of critics have maintained recently that, because of indexation, monetary policy in Iceland is less effective in controlling inflation than it would otherwise be. This argument is supported with the

reasoning that, over long periods, there seems to be little connection between the Central Bank's policy rate and indexed interest rates on long-term loans. That observation is correct – the connection between the policy rate and indexed long lending rates does appear limited – and enhancing the impact on those lending rates would certainly strengthen monetary policy. The policy rate's limited impact on long-term lending rates is not a uniquely Icelandic problem, however, and there are few indications that the problem is related to the indexation of financial obligations. In numerous studies conducted abroad, economists have found that short-term interest rates have little effect on long-term rates, which are often influenced primarily by global factors. Although this applies rather to small, open economies (Iceland is certainly small, but in terms of foreign trade, it is less open than many other economies in Northern Europe), studies indicate that it applies as well to larger economies such as the United States. Some studies also indicate that globalisation has narrowed the difference between long-term rates in individual countries.<sup>9</sup> In a recent study, Christian Upper and Andreas Worms (2003) concluded that short-term real interest rates in a given country affect long-term real rates in that same country. They believe that this connection has weakened and state that they cannot exclude the possibility that their findings may reflect that short-term interest rates rise with increases in long-term real interest rates because of expected rises in GDP growth. Upper and Worms' study suggests a strong relationship between long-term real interest rates, on the one hand, and fiscal deficit and debt accumulation, on the other.

The Central Bank's monetary policy measures at any given time – *and more importantly, expectations concerning the Bank's future decisions* – affect long-term interest rates through their impact on expectations about real interest rates and inflation in the future. If real short-term rates are expected to be high in one to two years' time (for example, due to foreseeable public sector need for significant credit and announcements of tight monetary policy by the Central Bank), this will affect current long-term interest rates. In this context, it does not matter whether the loans concerned are indexed or not. Expectations concerning the effect of monetary policy on inflation are reflected in current long-term nominal interest rates. This impact on nominal rates is not directly visible when loans are indexed (and changes in nominal rates do not emerge until later, when payment is made on the loan), but this should not compromise the effectiveness of monetary policy, as market agents make decisions based on real interest rates and/or expected real interest rates.

In economies with open capital markets, foreign interest rates and expected exchange rate movements have a strong impact on domestic interest rates. Foreign investors' knowledge of the financial market and their confidence in the economic system and the government are influential factors as well. Only a few years ago, foreign investors had little interest in the Icelandic financial market, and efforts

9. See, for example, Blanchard and Summers (1984), Barro and X Sala-i-Martin (1990), and Al Awad and Goodwin (1998). Már Gudmundsson (2008) discusses the effects of globalisation on interest rates and monetary policy.

to introduce them to it yielded limited success, in spite of relatively high and safe returns and convenient opportunities to hedge against risk because economic cycles in Iceland are different from those in other countries. When investors suddenly became interested in Iceland a few years ago, it was to be expected that this new focus would affect domestic interest rates.

## Fixed and variable interest rates

In the United Kingdom and the other Nordic countries, it is common that long-term mortgage interest is variable and follows some market interest rate at any given time. This is also true of the foreign-denominated currency basket loans offered by Icelandic banks. In the past, indexed mortgage loans always bore fixed interest, but more recently, loans with review clauses have also been available, making it possible to adjust the interest rate every few years, which is much more seldom than in nearby countries offering variable nominal rates. It should be borne in mind, however, that a substantial share of nominal interest rate changes abroad is due to changes in the rate of inflation and inflation expectations, which are automatically factored into the calculation of debt service on indexed loans.

If credit markets are efficient, fixed long-term real interest rates will reflect short-term real rates. In equilibrium, it should be expected that the costs attached to a loan with a fixed real interest rate will be similar to those for a loan with a variable real interest rate. Fixed real rates reduce the risk accompanying interest rate fluctuations. It could be beneficial to borrowers and lenders alike to protect themselves from such volatility.

Long-term interest rates generally change much less than short-term rates do. For example, if it is expected that, for the next year, short-term real interest rates will be 5% higher than previously assumed, this should lead to an approximately 0.5% rise in the fixed real interest rate on a 10-year loan. Therefore, if long-term interest rates rise incrementally in the wake of an increase in short-term rates, this does not indicate that monetary policy has limited impact. An increase in current short-term interest rates that prompts the market to expect lower interest rates in the future (for example, because efforts to control inflation through higher interest rates have been successful) need not result in a rise in long-term rates. In such instances, long-term interest rates could even decline.

If interest rates do not exhibit trends, average long-term rates – for example, 20- to 40-year rates – should remain rather stable. Under these circumstances, it matters very little to a borrower taking a variable-rate loan when he actually borrows the money. If he takes the loan when interest rates are relatively high, his debt service will be rather high at first, but over the entire term of the loan it should be relatively stable. Thus an increase in variable long-term rates should not affect demand for long-term loans to any marked degree. If interest rates are fixed for the entire loan period, however, the actual rate at the time the loan is taken is of vital importance. An amortised 25-year loan taken at a fixed real interest rate of 5% is 11% more expensive than a corresponding 4% loan and 24% more expensive than a corre-



sponding 3% loan. If the loan period is 40 years, these percentages are 15% and 35% respectively. Hence a potential borrower who considers long-term real interest rates to be relatively high will doubtless delay the proposed investment or seek out a variable-rate loan. An increase in fixed real interest rates should therefore have considerable impact on demand for credit.

If a fixed-rate loan is indexed, the nominal interest rate on the loan changes in line with headline inflation. If the nominal interest rate on a variable-rate loan changes in line with expected inflation that is estimated correctly, the only difference between the indexed loan and the nominal-rate loan is that indexation entails adding a portion of each current instalment to the principal and paying it later.

It has been demonstrated that, in order to control inflation, central banks must respond to increased inflation by raising their policy rate in excess of the rise in inflation, in effect raising the real policy rate. In the monetary policy rule named after economist John B. Taylor, the interest rate is raised by 1.5% for each 1% rise in inflation, which means that the real interest rate increases by 0.5%.<sup>10</sup> If long-term interest rates are variable, this temporary increase in real rates should not greatly affect demand for credit. However, if an increase in the real interest rate raises debt service for all borrowers who have taken such loans, effectively reducing the amount of money they can allocate to other uses, demand will contract and inflationary pressures will ease.

Debt service on indexed loans also rises in line with inflation, which siphons off demand for other goods and services. If real interest rates are fixed, however, debt service will rise by a smaller margin than it will if the central bank sets its policy rate according to the Taylor rule and long-term rates reflect the policy rate.

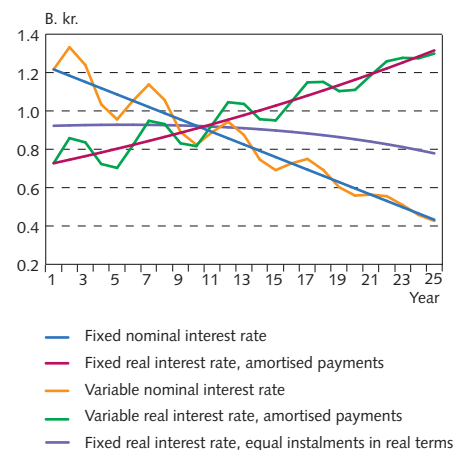
## Distribution of debt service – amortised loans

In general, indexed mortgage loans in Iceland are amortised; that is, the real value of interest and principal payments remains constant. Accrued interest is highest at the outset, when the outstanding balance of the loan is greatest. If accrued interest is paid in full on each payment date and instalments on the principal are fixed, debt service on long-term loans will vary. The longer the term of the loan and the higher the interest rate, the greater the variation in debt service will be. Chart 1 shows the repayments on a 25-year loan of 10 m.kr. The chart assumes a 5% real interest rate, 2.5% inflation, and a 0.5% premium on the real interest rate of a nominal loan due to uncertainty about inflation (c in the formulae above).<sup>11</sup> The blue line illustrates repayments if the nominal interest rate is fixed at 8.2%, and the yellow line shows how payments develop when the nominal interest rate fluctuates between 9.7% and 6.6% but averages 8.2%.

10. See J.B. Taylor (1993). The Taylor rule and other monetary policy rules are discussed in "QMM – A quarterly macroeconomic model of the Icelandic economy" (2007).

11. This is a somewhat smaller premium than is presented in the comparison of indexed and nominal interest rates on commercial and savings banks' lending during the period 1986–2002, as is explained on p. 91 of the Central Bank report to the Ministry of Commerce (2003), but the same as that used in the Central Bank's quarterly macroeconomic model (QMM).

Chart 1  
Nominal value of repayments  
25-year loan, ISK 10,000,000



Source: Central Bank of Iceland.

The red line illustrates repayments of an amortised loan bearing a fixed real interest rate of 5%, and the green line shows how payments change when the real interest rate fluctuates between 6.5% and 3.5% while averaging 5%. Finally, the purple line illustrates repayments when the loan agreement provides for a fixed real interest rate of 5% and equal instalment payments in real terms.

The last payment of the nominal-rate loan is 64% lower than the first payment, while the last payment of the real-rate loan with an equal instalment provision is 81% higher than the first payment. If the loan agreement provides for a real interest rate and equal instalments in real terms (as is shown by the purple line), the last payment is 16% lower than the first.

Chart 2 is structured the same way as Chart 1, except that it shows the real value of the repayments.

The chart shows that the real value of the last payment on the nominal-rate loan is 80% lower than that of the first payment. In the example involving a fixed real interest rate and equal instalments, there is no difference in the real value of the first and last payments, but if the loan agreement provides for a fixed real interest rate and equal instalments in real terms, the real value of the last payment is 53% lower than that of the first.

Chart 3 depicts developments in repayments of these same loans as a proportion of income (wages). It is assumed that real wages rise by about 2% per year, a slightly more modest increase than has occurred in Iceland over the past few years. It is further assumed that the first payment on the indexed amortised loan amounts to 20% of the borrower's income. Given these premises, the first payment of an equivalent nominal-rate loan is 33% of the borrower's income and the first payment of an equivalent indexed loan with equal instalments in real terms is 25% of the borrower's income.

In all instances, payments diminish as a proportion of income. The smallest decline is in the case of the indexed amortised loan, where the last payment is 12% of the borrower's income. The second-smallest decrease is for the indexed equal-instalment loan, for which the last payment is 7% of the borrower's income. In the case of the nominal-rate loan, the last payment declines most, to 4% of the borrower's income.

Assumptions concerning inflation make a significant impact on payments of nominal-rate loans. The charts below are all based on the same premises as Charts 1-3, except that they assume inflation to be 12% per annum instead of 2.5%. Chart 4 shows that, because of inflation, payments on nominal-rate loans decrease very rapidly over time.

This means, of course, that the real value of the payments drops even faster than in the example above, which assumes 2.5% inflation. Chart 5 shows that the last payment is now 99.8% lower in real terms than the first payment, and not 80% lower. In this case, the tenth payment is 75% lower than the first payment, while it is 39% lower if inflation is 2.5%.

Chart 6 illustrates developments in loan payments as a proportion of income, where the first payment of an indexed amortised loan

Chart 2  
Real value of repayments  
25-year loan, ISK 10,000,000

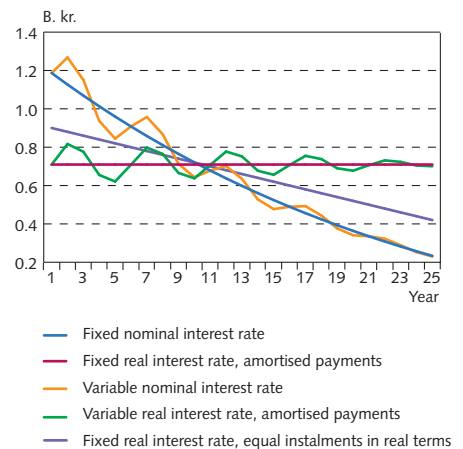


Chart 3  
Repayments as proportion of wages  
25-year loan, ISK 10,000,000

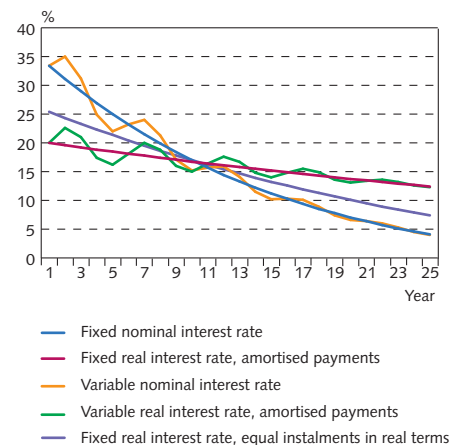
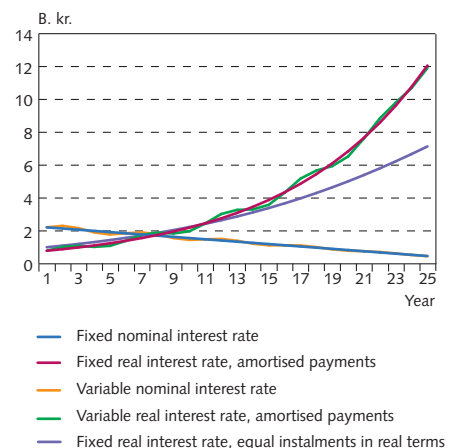


Chart 4  
Nominal value of repayments  
25-year loan, ISK 10,000,000



is 20% of the borrower's income. Now an equivalent nominal-rate loan with equal instalments must bear 17.6% interest, and the first payment will amount to 56% of the borrower's income.

These changes in the real value of payments on nominal-rate loans taken for a period of several years in an inflationary climate caused serious problems in Iceland in the 1970s, when inflation was very high. The response at that time was to add a portion of interest and instalments to the principal of bank loans in order to even out the debt service. This measure was a step towards loan indexation.<sup>12</sup>

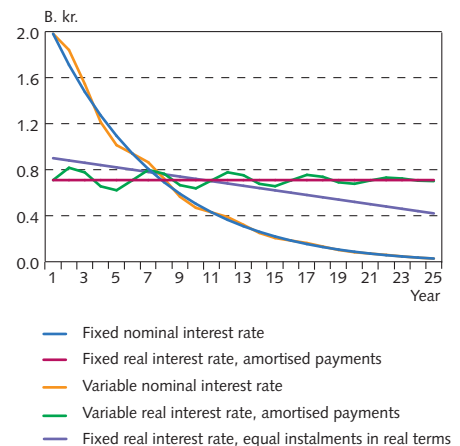
## Refinancing and new loans

A comparison of the charts above reveals that the repayment profile varies greatly depending on the type of loan involved. Where nominal-rate loans are common, the debt service burden on long loans is extremely heavy at first but then falls off rapidly. Indexation makes it possible to even out the payments. This equalisation of debt service over time is enhanced still further if the loan is indexed and amortised. If the debt service is estimated correctly at the outset, it should be more efficient to equalise it. This should also diminish the need to renegotiate long-term loans.

If there is a significant difference in repayments, there will also be a significant difference in changes to the outstanding loan balance. Based on the premises given in the example above – that is, a 5% real interest rate, 25-year loan period, 2.5% inflation, and 0.5% premium on the nominal interest rate due to uncertainty about inflation – and assuming that the stock of outstanding loans is composed of loans that have grown in direct proportion with GDP growth, or 3% per year, the nominal value of the outstanding balance of older loans will decline by 8.5% in the case of amortised loans with a fixed real interest rate, but by 11.6% in the case of nominal-rate loans with equal instalments. In order to keep the debt burden unchanged, new loans during the year must be equal to the reduction in the outstanding balance, plus the new loans taken. This assumes that GDP growth is 3%, so that the nominal value of GDP grows by 5.6%; thus, the amount of outstanding loans must grow by the same percentage. If the loans are amortised and bear a fixed real interest rate, new loans must total 15.4% of the total loan stock ( $= (1+0.056)/(1-0.085)-1$ ) in order for the debt burden to remain unchanged, but 19.4% if the loans feature a nominal interest rate and equal instalments.

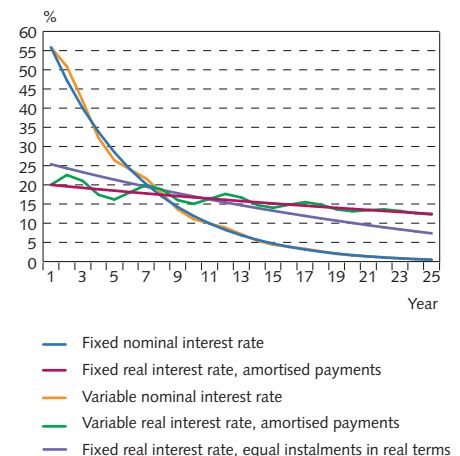
If the loans are amortised and bear a fixed real interest rate, the nominal value of the balance due will decline by 8.5% irrespective of inflation. This is not the case for nominal-rate, equal instalment loans. In that instance, the outstanding balance drops by 11.6% if inflation is 2.5% as specified above, but by 13.3% if inflation is 5% and by roughly 18.1% if inflation is 12%. New loans must then equal 21.8% of the total loan stock if inflation is 5%, and 28.8% if inflation is 12%. If monetary policy affects the supply of new loans, flexibility is

Chart 5  
Real value of repayments  
25-year loan, ISK 10,000,000



Source: Central Bank of Iceland.

Chart 6  
Repayments as proportion of wages  
25-year loan, ISK 10,000,000



Source: Central Bank of Iceland.

12. Icelanders have lived with inflation for a very long time; hence indexation is a well-known phenomenon. Since the 1960s, mortgage loans granted by government agencies have been indexed to some extent. This is discussed in detail in the paper by Bjarni Bragi Jónsson (1998).

obviously much greater if long-term loans are nominal-rate loans with equal nominal instalment payments rather than amortised fixed-real-interest loans, as is customary in Iceland. The difference is relatively small when inflation is low but grows rapidly as inflation rises.

This observation suggests that monetary policy may possibly be more effective in other nations because it affects the supply of new credit, which weighs more heavily in countries where long-term loans bear variable nominal interest rates. If so, there are probably some benefits to this. However, there could also be disadvantages if limitations on the supply of credit hinder individuals from distributing their expenses over time in the way that they consider most beneficial.

It is difficult to assess this particular disadvantage. However, it is notable that, in spite of the above-mentioned advantages of indexed amortised loans – that is, the even distribution of payments over time – Iceland stands out in terms of wide swings in private consumption, which has fluctuated significantly more than income has. Although fluctuations in private consumption have diminished in recent decades (that is, until the current year),<sup>13</sup> they have subsided much less than fluctuations in national income, which indicates that improved economic policy would prove extremely beneficial.

## Conclusion

Central banks in many countries are faced with the problem that monetary policy has little impact on long-term interest rates. As yet, no credible arguments have been presented to indicate that indexation exacerbates this problem. If the inflation outlook is extremely uncertain, indexation is a precondition for a supply of long-term credit. Under such circumstances, indexation is often quite important for the efficiency of financial markets and should tend to enhance monetary policy effectiveness and combat inflation.

There is a significant difference between the effects of fixed versus variable interest rates on demand for credit. If monetary policy affects fixed long-term real interest rates, it should have a greater effect on demand for credit than a corresponding increase in real interest rates on long-term variable-rate loans. An increase in variable interest rates over and above inflation, however, raises the debt service on such loans more than on indexed fixed-rate loans, and curtails demand for other goods, especially if access to credit is limited.

Indexation and amortisation of debt obligations even out the debt service burden over time. In most cases this is beneficial to both borrower and lender, especially if there is substantial uncertainty about inflation and hence about the distribution of the debt service burden, as is usually the case when inflation is high. On the other hand, a consequence of more equal distribution of debt service is that new loans constitute a lower percentage of the outstanding loan stock at any given time. Net asset formation will also be slower. If monetary policy influences the supply of new loans, however, it has greater potential to affect demand and inflation in countries where long-term loans bear nominal interest rates and equal instalments.

13. See Ásgeir Danielsson (2008).

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