

SPECIAL ANALYSIS

Macroeconomic effects of a debt-to-income limit

A limit of 600 per cent on the debt-to-income ratio would curb growth in household debt and could have negative effects on GDP. Housing prices would also rise more slowly, although this effect would to some extent be tempered by lower growth in housing investment. This analysis is based on the NIER's *Occasional Studies* No. 50⁹⁷.

This special analysis looks at the short-term effects on the macroeconomy of a debt-to-income (DTI) limit capping the amount of debt the individual household can have in relation to its disposable income.

A household that borrows heavily in relation to its income and wealth is taking a risk. Unforeseen changes in income or asset values could have profound financial consequences for such a household. This risk-taking is a natural part of a market economy. But if overall risk-taking in the economy is excessive, shocks to the economy could lead to a severe economic downturn which, in turn, could impact on financial stability.

Rules that place constraints on households' ability to borrow should be motivated by information or market failures. The NIER does not take a position here on whether or not there have been sufficient such failures to warrant restrictions on households' freedom of choice.

DTI LIMITS HAVE BOTH PROS AND CONS

Household debt levels can impact on macroeconomic performance. For example, households with large debts may choose to save extensively following a drop in housing prices. This will affect demand in the economy negatively unless fiscal or monetary policy is able to stabilise demand. It is therefore possible that rules restricting households' DTI ratio will have economic benefits in the form of more stable demand growth.

Experience from the most recent financial crisis also shows that a poorly functioning financial system can result in heavy economic costs. For example, productive investment may be negatively affected, and economic policy instruments may be less effective. If macroprudential measures help decrease the risk of financial instability and increase resilience in the financial system,

⁹⁷ The study was produced in collaboration with Finansinspektionen, see "Kortsiktiga makroekonomiska effekter av kreditbegränsande makrotillsynsåtgärder" [Short-term macroeconomic effects of credit-constraining macroprudential measures], *Occasional Studies* No. 50, NIER, May 2016 [in Swedish only].

further economic benefits will be reaped. In the first instance, however, increased capital requirements would appear to be the most appropriate means of reducing risks of this kind.

A ceiling on household debt will also have its costs. A DTI limit will impair some households' ability to even out consumption over time and finance home purchases. This translates into welfare losses for the individual household and can also have negative effects on GDP.

To analyse the short-term effects of a DTI limit on the macroeconomy, we compare two scenarios: a base scenario and a scenario with a DTI limit.

BASE SCENARIO

In the base scenario, no DTI limit is imposed, and GDP, wages and the central bank policy rate move in line with the NIER's medium-term scenario published in December 2015.⁹⁸ Developments in housing prices are estimated using Finansinspektionen's model for household debt⁹⁹ conditioned on the NIER's macroeconomic scenario for GDP, interest rates and household income.

Individual households' need for new mortgage loans is based on an assumption for housing turnover and the forecasts for housing prices and household income.¹⁰⁰ The total need for new mortgage loans represents aggregate growth in household debt in the base scenario.

SCENARIO WITH DTI LIMIT

In the alternative scenario, a DTI limit of 600 per cent is imposed. This prevents a household from taking out new mortgage debt if its liabilities would then exceed six times its disposable income.¹⁰¹

Households are assumed to react in two different ways if refused a loan on the grounds of this limit: either all households affected decide not to increase their debt at all, or all households affected decide to borrow up to the 600 per cent ceiling. Both assumptions can be seen as the extremes for how households might reasonably behave.

⁹⁸ The forecast is presented in *The Swedish Economy*, December 2015, NIER.

⁹⁹ See "En modell för hushållens skulder" [A model for household debt], *Fi-analys* No. 4, 1 December 2015, Finansinspektionen.

¹⁰⁰ Calculations based on Finansinspektionen's mortgage survey.

¹⁰¹ Disposable income is defined here as income from labour, capital and transfers after tax. This differs from the definition in the Swedish national accounts in several respects. Most significantly, perhaps, disposable income in the national accounts is net of interest costs.

After ten years, aggregate household debt is 19 per cent lower in the alternative scenario than in the base scenario in the case where all households affected choose not to take out new mortgage debt, and 7 per cent lower in the case where all households affected borrow right up to the DTI limit.¹⁰² This change in household debt impacts in turn on other macroeconomic variables.

MODELS FOR ESTIMATING THE MACROECONOMIC EFFECTS

Four different models are used to estimate the effects of a DTI limit on the macroeconomy, with the emphasis on the GDP effects.

Two of the models are Bayesian vector autoregression (BVAR) models. Both include mortgage rates, household debt and housing prices. One also includes disposable income, whereas the other instead has household consumption and housing investment. In the four-variable BVAR model, GDP is assumed to follow disposable income. In the five-variable BVAR model, disposable income and GDP are instead assumed to follow household consumption and housing investment.

The third model is a dynamic stochastic general equilibrium (DSGE) model applied to Swedish data.¹⁰³ It includes household debt, household consumption, housing investment, GDP, housing prices and inflation. Disposable income is assumed to follow GDP. Unlike BVAR models, DSGE models have a strong foundation in economic theory. In the variant used here, there are two types of household in the economy: patient and impatient. The impatient households borrow (against their home) from the patient households.

The fourth model is a macroeconometric model that includes housing investment, household consumption, household debt and housing prices. This model is normally used by the NIER as a basis for its forecasts of household consumption, housing investment and housing prices. It has a stronger foundation in economic theory than the BVAR models, but less so than the DSGE model. On the other hand, the macroeconometric model has a greater empirical content than the DSGE model.

¹⁰² For charts showing how debt moves in the different scenarios, see *Occasional Studies* No. 50, NIER, May 2016.

¹⁰³ See Walentin, K., "Housing collateral and the monetary transmission mechanism", *Scandinavian Journal of Economics*, 116(3), 2014, pp. 635–668.

EFFECTS ON THE MACROECONOMY OVER THE NEXT THREE YEARS

Tables 24 and 25 present the effects of the DTI limit on growth in the selected macro variables during the first three years after its introduction. The macro variables are in current prices. The intervals in the tables reflect the results of the four different models. Some of the models do not, however, produce results for all of the variables in the tables. For example, the four-variable BVAR model does not give a result for household consumption and is not therefore represented in the interval for household consumption.

Table 24 shows the effects of a 600 per cent DTI limit where the households affected by the cap decide not to take out any further mortgage debt at all. In this case, the annual rate of growth in household debt decreases by 2–3 percentage points during the first three years, and housing price inflation slows by 0–3 percentage points. Both of these restrictive effects are in line with the intentions of the DTI limit. One effect that may pull housing prices in the other direction is lower growth in housing investment. Disposable income, household consumption, GDP and CPIF¹⁰⁴ inflation are affected to a lesser degree. For example, GDP growth in current prices slows by 0.0–0.3 percentage points in the first year and 0.0–0.6 percentage points in the third year.

Table 24 Macroeconomic effects of a 600 per cent DTI limit where households affected take out no new loans

Deviation in growth rate from base scenario, current prices, percentage points

	Year 1	Year 2	Year 3
Household debt	-1.9	-2.9	-2.8
Disposable income ¹	-0.3 to 0.0	-0.5 to 0.0	-0.6 to 0.0
Household consumption ²	-0.3 to 0.0	-0.6 to 0.0	-0.9 to 0.0
Housing investment ²	-4.1 to 0.0	-5.9 to -0.1	-4.1 to -0.1
GDP, current prices ¹	-0.3 to 0.0	-0.5 to 0.0	-0.6 to 0.0
Housing prices	-2.0 to 0.0	-2.6 to -0.1	-1.9 to -0.1
CPIF ^{1,3}	0.0 to 0.2	-0.3 to 0.0	-0.4 to 0.0

¹ No result from the macroeconomic model. ² No result from the four-variable BVAR model. ³ For estimates of the CPIF in the BVAR models, see *Occasional Studies* No. 50, NIER, 2016.

Note. Intervals reflect the results of four different models: a four-variable BVAR model, a five-variable BVAR model, a DSGE model and a macroeconomic model.

Sources: Finansinspektionen and NIER.

¹⁰⁴ CPI with a fixed mortgage interest rate.

Table 25 shows the effects of the same DTI limit as above under the assumption that the households affected by the cap decide to borrow up to the level of the limit. In this case, the annual rate of growth in household debt decreases by around 1 percentage point during the first three years. House price inflation and housing investment also slow somewhat, but the decrease in growth in disposable income and household consumption is limited. Annual GDP growth slows by a modest 0.0–0.2 percentage points in the first three years, while CPIIF inflation is barely affected at all.

Table 25 Macroeconomic effects of a 600 per cent DTI limit where households affected borrow up to that limit

Deviation in growth rate from base scenario, current prices, percentage points

	Year 1	Year 2	Year 3
Household debt	−0.7	−1.0	−1.0
Disposable income ¹	−0.1 to 0.0	−0.2 to 0.0	−0.2 to 0.0
Household consumption ²	−0.1 to 0.0	−0.1 to 0.0	−0.2 to 0.0
Housing investment ²	−1.6 to 0.0	−2.4 to 0.0	−1.7 to 0.0
GDP, current prices ¹	−0.1 to 0.0	−0.2 to 0.0	−0.2 to 0.0
Housing prices	−0.8 to 0.0	−1.0 to 0.0	−0.7 to 0.0
CPIF ^{1,3}	0.0 to 0.1	−0.1 to 0.0	−0.1 to 0.0

¹ No result from the macroeconomic model. ² No result from the four-variable BVAR model. ³ For estimates of the CPIIF in the BVAR models, see *Occasional Studies* No. 50, NIER, 2016.

Note. Intervals reflect the results of four different models: a four-variable BVAR model, a five-variable BVAR model, a DSGE model and a macroeconomic model.

Sources: Finansinspektionen and NIER.

EFFECTS ON THE MACROECONOMY AFTER TEN YEARS

After ten years, the effects of the DTI limit follow a similar pattern to those during the first three years. Household debt, housing prices and housing investment decrease relatively more than the other macro variables. As at the three-year horizon, the effects are stronger in the case where households affected by the ceiling choose not to borrow further rather than to borrow up to the limit.

Table 26 shows the effects of the DTI limit on the level of the selected macro variables ten years after its introduction. The macro variables are in current prices. The second column (“0 per cent”) presents the case where households affected by the limit decide not to take out any more mortgage debt. After ten years, household debt is then 19 per cent lower with the limit than without it. The changes to debt and income result in the DTI ratio decreasing by between 30 and 38 percentage points

with the limit. Both housing prices and housing investment are lower. GDP after ten years is 0–4 per cent lower when the DTI is capped.

The third column (“600 per cent”) presents the case where households affected by the ceiling opt to borrow right up to the maximum of six times their income. Here, the results are roughly one-half to one-third as strong as in the case where the households affected take out no further debt. For example, GDP after ten years is then 0.1–1.7 per cent lower with the DTI limit.

The DTI limit continues to impact on GDP after as long as ten years in some of the models. This is partly because the cap is assumed to restrict mortgage borrowing during that ten-year period by new households not previously affected by the limit. The results of the models are based on the relationships between debt and the macroeconomy observed in the period 1995–2015 without long-term restrictions being imposed on the estimates. There is a considerable risk that these relationships would change with a DTI limit, probably in the direction of lesser long-term effects on GDP.

Table 26 Macroeconomic effects of a 600 per cent DTI limit after ten years

Deviation from base scenario, current prices, change in level in per cent or percentage points

	Year 10, 0 per cent	Year 10, 600 per cent
Household debt ¹	-19.1	-7.2
Disposable income ^{1,3}	-4.2 to -0.2	-1.7 to -0.1
Debt-to-income ratio ^{2,3}	-37.6 to -30.2	-14.2 to -11.0
Household consumption ^{1,4}	-6.9 to -0.2	-1.8 to -0.1
Housing investment ^{1,4}	-13.4 to -0.5	-6.0 to -0.2
GDP ^{1,3}	-4.2 to -0.2	-1.7 to -0.1
Housing prices ¹	-12.6 to -0.9	-4.8 to -0.3
CPIF ^{1,3}	-1.9 to -0.1	-0.7 to -0.1

¹ Change in level in per cent. ² Change in level in percentage points. ³ No result from the macroeconomic model. ⁴ No result from the four-variable BVAR model.

Note. Intervals reflect the results of four different models: a four-variable BVAR model, a five-variable BVAR model, a DSGE model and a macroeconomic model. For estimates of the CPIF in the BVAR models, see *Occasional Studies* No. 50, NIER, 2016.

Sources: Finansinspektionen and NIER.

The results from the DSGE model stand out from the results from the other three models. In the DSGE model, the 600 per cent DTI limit has almost no effect on disposable income, household consumption, housing investment, GDP or housing

prices after ten years. This is because restrictions on household debt have little impact on the supply variables that govern the long-term level of GDP in the DSGE model.

SIZE OF DTI LIMIT'S COSTS AND BENEFITS UNCLEAR

One economic benefit from the introduction of a DTI limit may be that the financial system becomes more robust. For example, a cap on mortgage borrowing could reduce the probability of a financial crisis or lessen the consequences of such a crisis. Another benefit may be that macroeconomic volatility decreases.

These benefits need to be weighed against the costs and welfare losses that could result from a DTI limit.

In the very long term, it is probably supply factors such as capital formation, hours worked and productivity that determine GDP. The DTI limit in this analysis is relatively high and applies only to households. It would not be expected to impact on these supply factors in the long run, with the result that its long-term GDP effect is limited.

The greatest cost is the welfare loss that arises when individual households are unable to distribute their consumption over time and finance home purchases as a result of the limit. For example, a DTI cap could limit opportunities for growing families to move to a larger home despite very promising earnings prospects. The value of this restriction on individual freedom of choice is very difficult to quantify in terms of consumer utility.

It is uncertain what effects a DTI limit would have on households' behaviour. For example, a limit that is not anticipated by households could lead to instability rather than the intended stability.

The results presented in this analysis paint a picture of the potential short-term costs of a 600 per cent DTI limit, including in terms of GDP in current prices. The estimates of the effects on the macroeconomy are uncertain, however. They vary between models and according to how households are assumed to react.

The estimates also assume that households are not able to circumvent the DTI limit. If households find ways of getting around the limit, both its benefits and the restrictive effects on the macroeconomy will be smaller.