

Box 1.2**Effects of Macroeconomic Stress Scenario on the Housing Credit Portfolio: The expected impact of a sharp increase in the interest rate and in unemployment on mortgages borrowers and on banks**

- This year, as well, the Banking Supervision Department conducted a macroeconomic stress test for the banking system, as commonly done around the world. The test is based on a uniform scenario applied to all banks, with the goal of contributing to understanding the focal points of risks to which the system is exposed. It is based on assessments and models, and does not constitute a forecast. (For more information, see Box 1.1, “Macroeconomic stress tests for the banking system, 2018”.)
- As part of this test, we extensively reviewed risk in the housing credit portfolio, based on granular data (at the individual loan level). Housing credit is a significant focal point when examining the risk faced by the banking system. This is due to the strong correlation with the construction and real estate industry, which may exacerbate loss due to feedback effects, and due to the significant share of this portfolio out of the entire banking credit portfolio, due to the rapid expansion of housing loans in the past decade.
- The share of the housing credit portfolio out of total credit extended by banks has gradually increased in recent years, but from a global perspective, the ratio of household housing debt to GDP in Israel is lower than in other advanced economies.
- This year’s stress scenario reflects two key influences on borrower repayment capacity—a marked increase in interest rates (by 5 percentage points) and rising unemployment (to 9.3 percent).
- The test outcome, similar to those of previous stress tests, indicates that risk in the housing credit portfolio remains low compared to other credit segments and that the portfolio’s quality has even improved in recent years.
- The improved quality and lower risk in the mortgage portfolio are due to stricter criteria applied to mortgage origination (underwriting), based on directives issued by the Banking Supervision Department over the years (with regard to the loan to value ratio (LTV), payment to income ratio (PTI), restrictions on adjustable interest and so forth).
- The test further indicates that the higher interest rates in the scenario have a significant impact on all mortgage borrowers in the market, due to the more onerous debt to income ratio—higher by 20 percent on average. However, only a small share of borrowers reach default due to the higher monthly payment associated with the higher interest rates. This is the outcome of a range of macroprudential measures applied over the years with regard to housing credit, and in particular—measures designed to reduce borrower exposure to higher interest rates.
- The increase in unemployment (by a considerable rate, in the scenario) is the key cause of borrower default: this increase would result in 5 percent of mortgage borrowers having difficulty making their debt payments, and those with lower income¹ are the most vulnerable.

¹ ¹ Bottom two quintiles in net income: Households with net monthly income of up to NIS 10,612.

Background

This year, too, the Banking Supervision Department carried out a macroeconomic stress test for the banking system, as commonly done worldwide. This test is based on a uniform scenario applied to all banks being tested. (For more information, see Box 1.1, “Macroeconomic stress tests for the banking system, 2018”.) As part of this test, we extensively tested the risk in the banking system’s housing credit portfolio. **The housing credit portfolio is a significant focal point when reviewing the risk faced by the banking system,** for the following reasons:

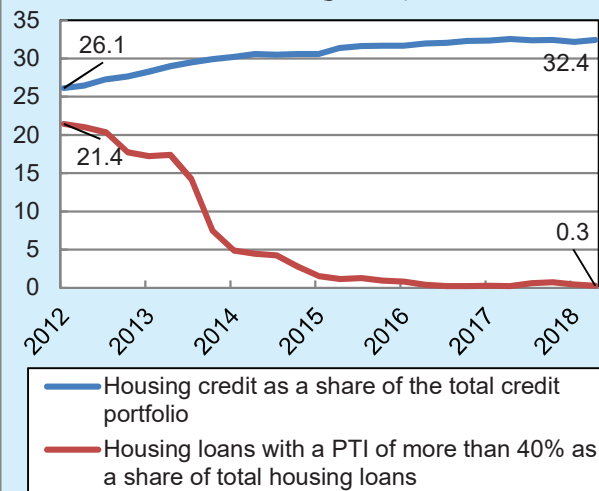
(a) Strong correlation with the construction and real estate industry, which may exacerbate loss due to feedback effects. (b) Strong correlation with consumer credit, which is expected to increase loss in this portfolio as well. (c) The significant share of this portfolio out of the bank credit portfolio: Housing loans grew rapidly over the past decade, primarily due to higher home prices and to the low interest rate environment. (However, this growth rate has somewhat moderated in recent years). At the

end of 2018, housing credit amounted to NIS 322 billion, or 32 percent of the banking credit portfolio, compared to only 20 percent in 2008. However, the increase in the ratio of household housing debt to GDP was moderate in recent years, and is lower than in other advanced economies (Figure 2).

Given the growth in the housing credit portfolio, the Banking Supervision Department took several steps in recent years in this area, designed to reduce borrower and bank exposure to risk associated with developments in the housing market. (For more information about some of these steps, see Box 1.1: “The Banking Supervision Department’s measures with respect to housing credit, and their implications” in the 2013 Banking Supervision Department—Annual Survey). **The range of steps taken by the Banking Supervision Department resulted, from the stability aspect—in improved quality of the housing credit portfolio, and from the consumer aspect—in reduced borrower sensitivity to potential changes in the economic environment** (such as higher interest rates). Thus, for example, the decision to restrict the share of mortgages bearing variable-rate interest (2011) moderates the impact of higher interest rates on the monthly payment and reduces borrower exposure to this risk.

Housing credit risk is low, but its share of the credit portfolio increased.

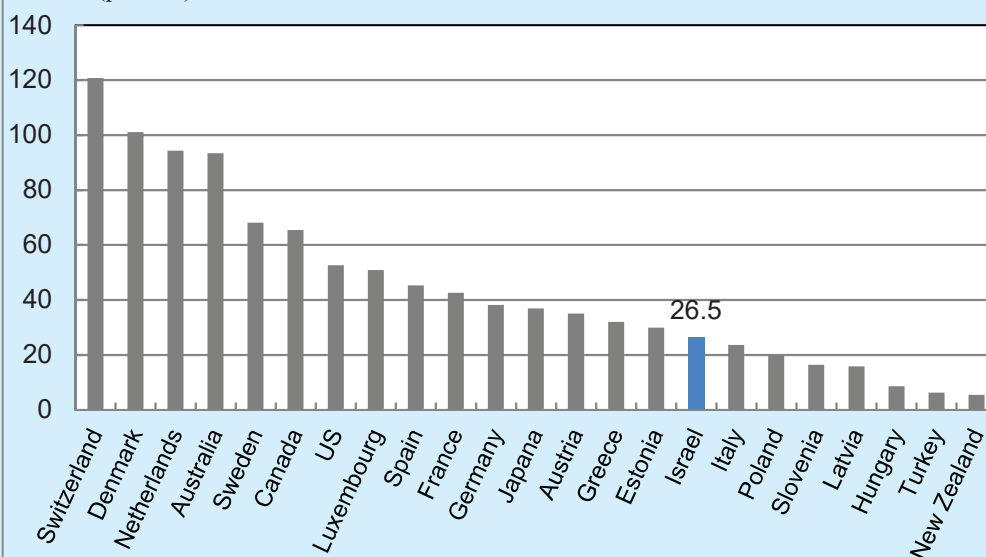
Figure 1
Housing Credit as a Share of the Credit Portfolio and Housing Loans with a PTI of More than 40% as a Share of Total Housing Loans, 2012–June 2018 (percent)



SOURCE: Based on reports to Banking Supervision Department.

The housing debt to GDP ratio in Israel is low by international comparison.

Figure 2
The Ratio of Housing Debt to GDP in Israel and Other OECD Countries, 2017^a (percent)



^a Data for the US and Hungary are 2016 data.

SOURCE: Israel—Bank of Israel; other countries—OECD.

Other steps taken by the Banking Supervision Department² resulted in a decrease in the monthly payment to income ratio (PTI), and in particular: The share of borrowers taking out loans with PTI over 40 percent³ declined dramatically, from 21 percent in 2012 to only 7 percent in 2013, and as from 2015, the share of such borrowers is negligible (Figure 1). This is a notable step toward reducing borrower vulnerability and reduced risk in the housing credit portfolio, since this borrower group is most sensitive to changes in interest rates and to reduced income.

In order to identify the main focal points of risk and to assess the vulnerability of banks and borrowers to changes in the economic environment, we conducted a bottom-up stress test⁴. **This test was based on a specific database, containing all housing loans extended by the banking system in 2015–17⁵.** The database contains 247,000 loans with a balance of NIS 161 billion, approximately 40 percent of the outstanding balance of housing credit. Use of this database has allowed us to classify those loans and households that may face difficulties in case of materialization of the stress scenario and to identify the

² Such as the prohibition on extending loans with payment to income ratio over 50 percent and the required further capital allocation with respect to loans with LTV ratio over 40 percent (as from August 2013).

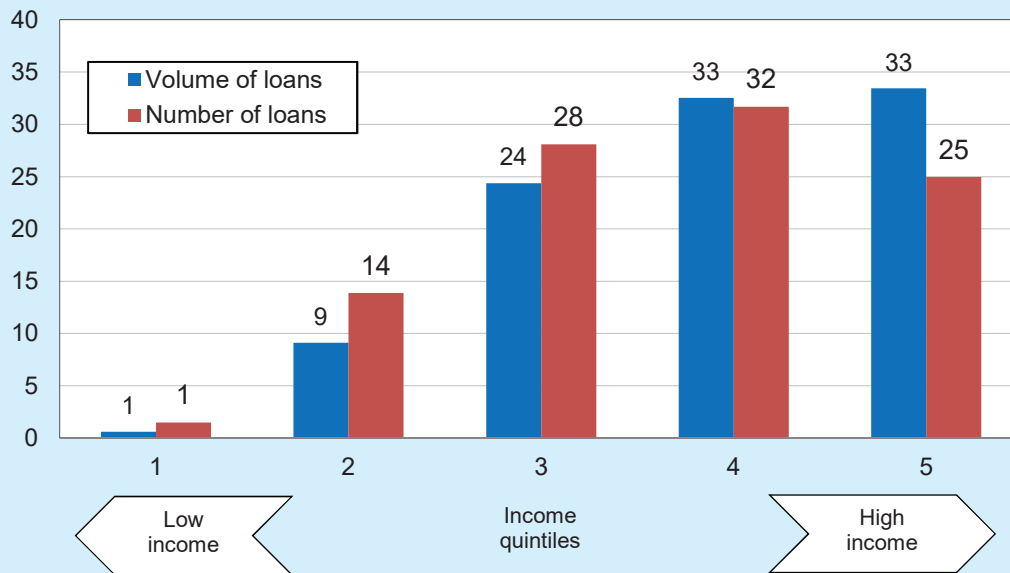
³ PTI is a key variable in assessing the probability of borrower default, since it reflects the household capacity to make the mortgage payment. It was found that financially vulnerable households are those with PTI ratio over 40 percent. Ong, M. L. (2014). "A guide to IMF stress testing: methods and models", International Monetary Fund.

⁴ Test based on loan-level data, used to estimate the potential impact of a stress scenario on the banking system.

⁵ For mortgages originated in prior years and in 2018, the analysis was also based on aggregate housing loan data.

Most housing loans are taken out by high-income households.

Figure 3
Distribution of the Number and Volume of New Loans by Income Quintiles, Total Banking System, 2015–2017^a (percent)



^a Based on total housing loans granted between 2015 and 2017.

SOURCE: Based on reports to the Banking Supervision Department.

main focal points of risk in the banking system resulting from exposure to housing loans.

Features of housing loans by income level

The distribution of loans extended in the reviewed period (2015–17) by income quintiles⁶ shows that the top two income quintiles in Israel (those with higher income—households with net monthly income higher than NIS 15,500) took out 57 percent of the loans originated in that period and 66 percent of the amount thereof. The bottom two income quintiles (those with lower income—households with net monthly income lower than NIS 10,500) took out 15 percent of the loans originated in that period and 10 percent of the amount thereof (Figure 3). This is due, *inter alia*, to the fact that a significant share of lower income households do not own a home⁷, and therefore do not take out housing loans—similar to findings in other countries.

The data further show that the burden of household housing debt significantly decreases with higher income. This is reflected both by the average number of monthly salaries needed for the household to

⁶ Income quintiles were determined by net monthly household income, based on the income survey conducted by the Central Bureau of Statistics in 2017 in households headed by a salary earner. This classification resulted in the following income quintiles: Bottom quintile – up to NIS 6,053; second quintile – NIS 6,053-10,612; third quintile – NIS 10,612-15,456; fourth quintile – NIS 15,456-22,644; top quintile – over NIS 22,644.

⁷ Central Bureau of Statistics, Housing in Israel – Findings from Household Expense Survey, 2017.

The debt burden relative to income is higher among low-income households.

Figure 4
Number of Income Months Required for a Household to Purchase a Dwelling, by Income Quintile, Total Banking System, 2015–2017^a (months)



^a Based on total housing loans granted between 2015 and 2017.
 SOURCE: Based on reports to the Banking Supervision Department.

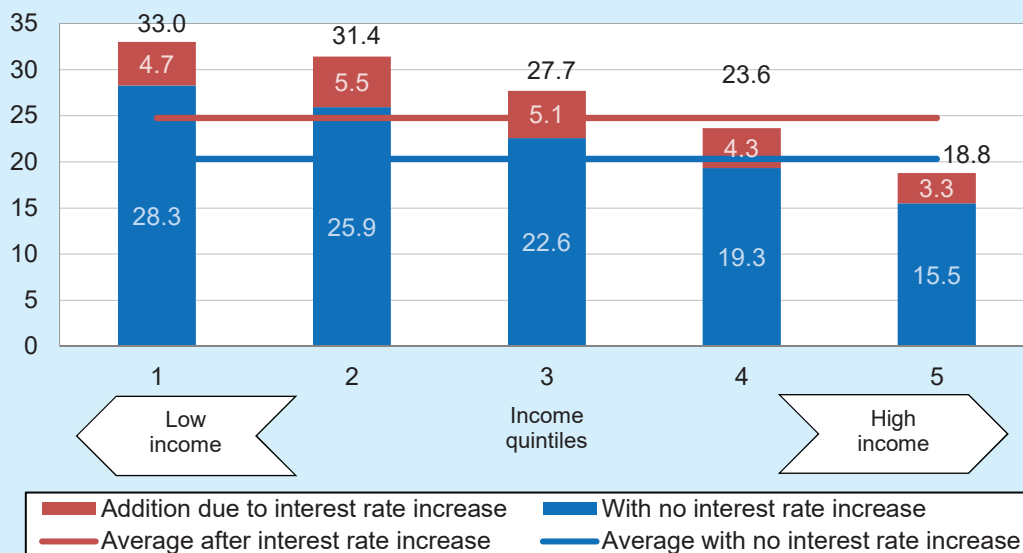
pay for the home bought using the mortgage—120 months in the second income quintile, compared to approximately half that period—60 months—in the top quintile (Figure 4)—and by the average PTI ratio, which is 26 percent in the second quintile, compared to 15 percent in the top income quintile (Figure 5). In order to identify the financially vulnerable households, it is important to examine the PTI distribution of all borrowers (not only the average payment), and in particular to focus on loans associated with a high debt burden—because at the edge of this distribution (higher PTI ratios) we can discern those borrowers who may face difficulties or even go into default. **One of the benchmarks for financial vulnerability commonly used worldwide is a PTI ratio higher than 40 percent.** As noted above, due to supervisory restrictions and directives, loans originated with such PTI ratios have been negligible since 2015; therefore, we estimated the share of financially vulnerable households based on the share of borrowers with PTI ratio higher than 35 percent (rather than 40 percent). We found that households with lower income are typically more vulnerable: About one-quarter of households in the bottom two quintiles took out loans with PTI ratio higher than 35 percent, compared to only 9 percent in the top two quintiles

Methodology

The objectives of the macroeconomic scenario are to contribute to understanding of the focal points of risk to which the banking system and each of the banks are exposed, and to serve as a tool to help

The debt burden relative to income increased in the stress scenario for all borrowers, but the increase was greater among low-income households.

Figure 5
PTI and its Increase Due to an Interest Rate Increase in the Stress Scenario, by Income Quintile, Total Banking System, 2015–2017^a (percent)



^a Based on total housing loans granted between 2015 and 2017.

SOURCE: Based on reports to the Banking Supervision Department.

assess the resilience of the banking system, a tool for setting requirements for the banking system and to banks, and to secure a sufficient level of capital. Therefore, the scenario reviewed the debt repayment capacity of households under extreme changes to the macroeconomic environment—an increase by 5 percentage points in interest rates, an increase in the unemployment rate to 9.3 percent, higher inflation and lower household income (Figure 1 in Box 1.1, “Macroeconomic stress test for the banking system, 2018”). These results are based on models and estimates, and are not a forecast.

In this review, the probability of default (PD⁸) for each loan is based on the financial margin⁹ of the household, which considers **the disposable income available after debt payment and current living expenses**.¹⁰ The assumption is that if disposable income is negative, the household would find it difficult to make the debt payment, and therefore was recorded as a borrower in default—a borrower who finds it

⁸ Probability of Default – a condition where the borrower is unable to repay the loan.

⁹ The borrower’s financial margin is calculated as follows:

$$FM_i = I_i - DP_i - BLC_i$$

where – net household income; – housing debt payments; – basic cost of living for the household.

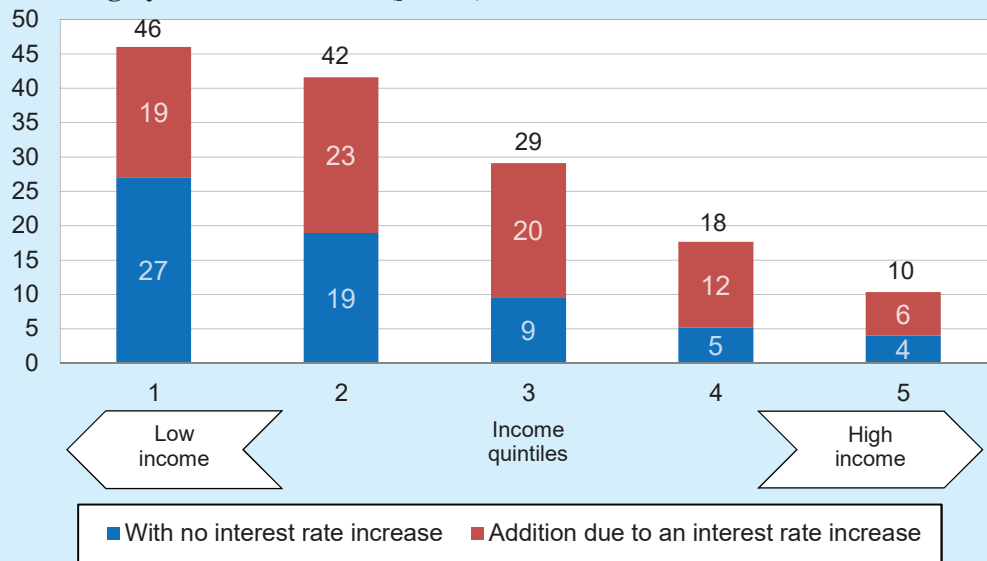
¹⁰ Based on the Central Bureau of Statistics’ expense and income survey, and on the assumption that the household would reduce their current consumption to make their debt payments.

difficult to make their monthly mortgage payment.

The probability of default¹¹ for each loan is calculated both at the outset (origination) and after the effect of the scenario. The higher interest rates and inflation impact the monthly mortgage payment, according to the mortgage tracks actually obtained, while the higher unemployment and lower real income impact household income. As in times of crisis it may be difficult to realize the properties of borrowers in difficulties, we assumed (by a stricter approach) that banks would be unable to realize these for loan repayment during the scenario period (3 years). That is, loss given default¹² is 100 percent for all borrowers, regardless of the value of collateral securing the loan. We should emphasize that in reality, we expect that the bank would find it difficult to realize the collateral within a specified time frame, but should be able to realize it later on.

There is more of a negative impact to low-income households, particularly in the scenario of an increase in the interest rate.

Figure 6
Percentage of Loans with a PTI Above 35%, and its Increase Due to an Interest Rate Increase in the Stress Scenario, by Income Quintile, Total Banking System, 2015–2017^a (percent)



^a Based on total housing loans granted between 2015 and 2017.

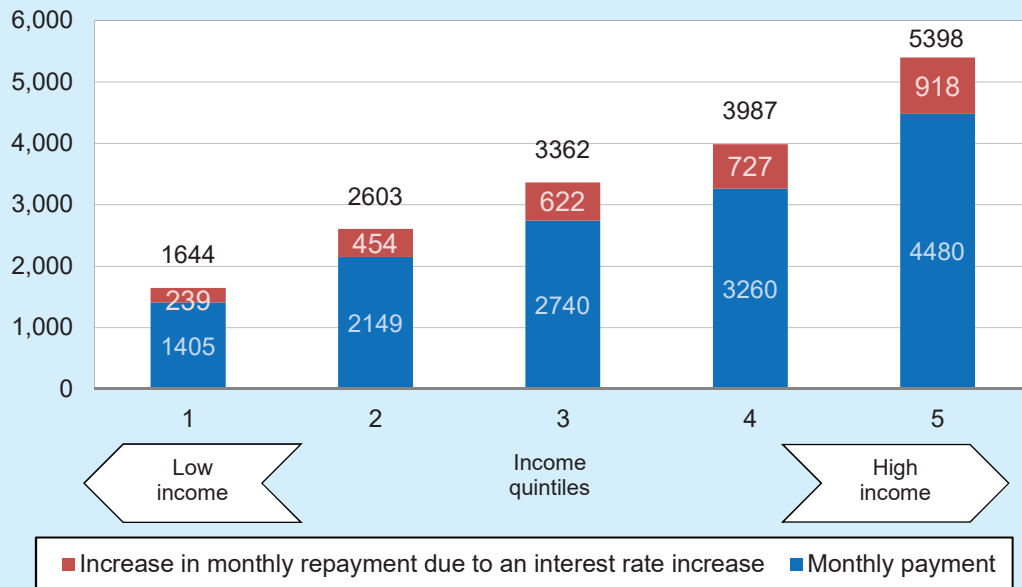
SOURCE: Based on reports to the Banking Supervision Department.

¹¹ Probability of Default.

¹² Loss Given Default.

In the stress scenario, monthly repayments for all borrowers are expected to increase due an interest rate increase.

Figure 7
Monthly Repayment, and its Increase Due to an Interest Rate Increase in the Stress Scenario, by Income Quintile, Total Banking System, 2015–2017^a (NIS)



^a Based on total housing loans granted between 2015 and 2017.

SOURCE: Based on reports to the Banking Supervision Department.

Findings

The test outcome, similar to those of previous stress tests, shows that risk in the banking system's housing credit portfolio remains low compared to other credit segments and that the portfolio quality has even improved in recent years. The scenario resulted in an average annual loss rate of 0.7 percent of the housing credit (mortgage) portfolio.

This scenario reflects two major effects on borrowers' repayment capacity: The effect of higher interest and inflation, and the effect of rising unemployment. **Our analysis¹³ shows that unemployment is the key factor in borrower default.** Thus, 5 percent of mortgage borrowers may find it difficult to repay their debt should a stress event materialize, and those with lower income¹⁴ are the most vulnerable: Some 15 percent of mortgage borrowers in the lower income quintiles may be in default.

It also emerged that higher interest rates had a significant impact on all mortgage borrowers, due to the higher debt burden. However, only a small share of borrowers may be in default due to the increase in

¹³ The test is based on certain working assumptions, which impact the quantitative outcome of the test. Results are based on a comprehensive database at the individual loan level, including all housing loans originated in 2015–17, along with aggregate data for housing loans in previous years and in 2018.

¹⁴ Bottom two quintiles in net income: Households with net monthly income of up to NIS 10,612.

monthly payment; this is the result of the range of macroprudential measures applied over the years with regard to housing loans, which also resulted in improved portfolio quality.

Due to an increase by 5 percentage points in the Bank of Israel interest rate, as examined in the stress scenario, the average monthly payment for a household in the second income quintile would increase by NIS 450, to NIS 2,600, whereby the average PTI ratio for such households would increase from 26 percent to 31 percent. However, the average payment for a household in the top quintile would increase by NIS 920, to NIS 5,400¹⁵, whereby the average PTI ratio would increase from 16 percent to 19 percent. Across all households, the average monthly payment would increase by 20 percent (Figures 5,7). The increase in monthly payment would result in a significant increase in the share of vulnerable households (with PTI ratio over 35 percent) – up to 56 percent of households in the bottom two income quintiles, compared to one-quarter of households in the top two income quintiles (Figure 6).

In addition to the effects of unemployment and interest rates on the housing loan portfolio, we should note that a significant share (40 percent) of households have also taken out a consumer loan, in addition to the housing loan, and would therefore face not only the higher payment rate of their mortgage, but also repayment of this other loan. This state of affairs increases the vulnerability of such borrowers and the likelihood of their facing difficulties in making their monthly payments.¹⁶ This means that such borrowers would cause banks to incur losses both for housing credit and for consumer credit. (For more details see Box 1.2: “Households’ participation in the loans market and their financial vulnerability: an analysis based on the household survey for 2016”, in the 2017 Banking Supervision Department—Annual Survey).

¹⁵ An increase in interest rates by one percentage point increases the average monthly payment for a household in the second quintile by NIS 100, and for a household in the top quintile—by NIS 200.

¹⁶ It is likely that in case of difficulties in debt repayment, they would try to continue their mortgage payment, hence repayment of the consumer loan would be impacted first.