Economic and Monetary Developments

Spring 2022

NÁRODNÁ BANKA SLOVENSKA
EUROSYSTÉM

www.nbs.sk

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EUROSYSTÉM

Published by

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Electronic version

https://www.nbs.sk/en/publications-issued-by-the-nbs/economic-and-monetary-developments

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Discussed by the NBS Bank Board on 29 March 2022.

ISSN 2729-8604 (ONLINE)

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Abbreviations

CPI	Consumer Price Index
EA	euro area
ECB	European Central Bank
EC	European Commission
EME	emerging market economy
EONIA	euro overnight index average
ESA 2010	European System of Accounts 2010
ESI	Economic Sentiment Indicator (European Commission)
EU	European Union
EUR	euro
EURIBOR	euro interbank offered rate
Eurostat	statistical office of the European Union
GDP	gross domestic product
HICP	Harmonised Index of Consumer Prices
IMF	International Monetary Fund
IPI	industrial production index
MFI	monetary financial institution
MF SR	Ministry of Finance of the Slovak Republic
MTF	NBS's Medium-Term Forecast (published on a quarterly basis)
NACE	Statistical Classification of Economic Activities in the European Community (Rev. 2)
NBS	Národná banka Slovenska
NEER	nominal effective exchange rate
NFC	non-financial corporation
OECD	Organisation for Economic Co-operation and Development
p.a.	per annum
p.p.	percentage point
PMI	Purchasing Managers' Index
REER	real effective exchange rate
SME	small and medium-sized enterprise
SO SR	Statistical Office of the Slovak Republic
ÚPSVR	Ústredie práce, sociálnych vecí a rodiny – Central Office of Labour, Social Affairs and Family
USD	US dollar
VAT	value-added tax

Symbols used in the tables
. – Data are not yet available.
- – Data do not exist / data are not applicable.
(p) – Preliminary data

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1 Summary

The war in Ukraine will slow the global economy's recovery. At the outset of the Russian invasion, commodity market prices rose sharply and financial market prices saw increased volatility. Not only is the war having tragic humanitarian consequences, including a refugee crisis, it will also bring significantly adverse economic effects.

Global inflation pressures will rise even further. Russia and Ukraine are major commodity-exporting countries, and the reduced availability of the commodities they export is expected to have an upward impact on global prices. The acceleration of global inflation related to the war's impacts will affect real incomes and dampen consumer demand.

The slowdown of global economic activity will affect the Slovak economy primarily through a softening of foreign demand. Persisting component supply problems are being compounded by further supply chain disruptions and logistics complications. This will be felt by the Slovak economy in coming months in particular.

Slovakia's economic growth will be slowed, so the economy will take longer to return to its pre-pandemic level. Given the framework for setting administered energy prices for households, we expect that next year will see price growth have a substantially adverse impact on households' purchasing power. The extent to which real income will decline will depend on potential fiscal measures aimed at offsetting the unfavourable trends in administered energy prices.

The best-case projection is that the Slovak economy will grow by between 2% and 3% in the years ahead and that inflation will peak next year at around 10%. This scenario assumes that the war is resolved within coming weeks. In the worst case scenario, assuming a more drawn-out conflict, the risk is that the economy will temporarily stop growing.

The inflation rate is expected to remain just below 8% this year, while in the following year, under the scenarios factoring in the war in Ukraine, it is expected to accelerate to between 10% and 14%. The inflation outlook is subject to high uncertainty generated by commodity markets. The recent period saw a sharp increase in market prices of gas, which is expected to pass through to administered prices from January 2023. There is, moreover, likely to be a shortage of certain commodities and upward pressure on food prices. Excessively rising input prices will also impact prices of other goods and services.

Public finances will face, in addition to an economic slowdown, the impact of funding for refugees. Under such assumptions, no sustained improvement in fiscal performance can be expected in the foreseeable future, and the fiscal deficit at the end of the projection period is envisaged to be high at between 4% and 6% of GDP.

Even before the Russia-Ukraine war, we were projecting an uptrend in inflation and a slowdown in economic activity. Since our previous forecast, expected developments in world commodity prices have been substantially revised, leading us to make a significant upward revision of the inflation projection, especially in 2023. Besides a decline in households' purchasing power, persisting supply chain disruptions and the partly related revision of global demand levels have resulted in an appreciable downward revision of the economy's projected performance in both 2022 and 2023. The war's impact is only amplifying these trends.

Table 1 Economic growth and inflation in the scenarios and the differences vis-à-vis the winter 2021 forecast (annual percentage changes; percentage point changes)

	Pre-war scenario			Adverse scenario			Severe scenario		
	2022	2023	2024	2022	2023	2024	2022	2023	2024
GDP	4.2	4.5	3.0	2.8	2.3	2.6	1.7	0.3	1.9
HICP inflation	7.2	4.6	1.6	7.6	9.7	2.8	7.8	13.8	4.1

Change vis-à-vis winter 2021 forecast	Pre-war scenario			Adverse scenario			Severe scenario		
	2022	2023	2024	2022	2023	2024	2022	2023	2024
GDP	-1.5	-1.0	0.2	-3.0	-3.3	-0.1	-4.1	-5.3	-0.8
HICP inflation	1.6	2.2	-0.3	2.1	7.3	0.9	2.2	11.4	2.2

Source: NBS calculations.

This current edition of the Economic and Monetary Developments (EMD) report includes three annexes in which we take a deeper look at certain current topics. The main takeaways from these analyses are as follows:

- Slovakia is dependent on Russia for supplies of natural gas (in 2020 Russian gas accounted for 85% of total natural gas imports). A potential 20% drop in gas imports is estimated to reduce real GDP by between 0.6% and 1.4%. The impact on GDP is moderated by the fact that the most gas intensive industries make a relatively low contribution to overall value added. In the event of gas shortages, the gas price will inevitably rise. It is estimated that a gas price increase of 185% would cause industrial producer prices to rise by between 1.6% and 2.6%.
- We estimated shortages resulting from supply chain disruptions, in addition to shortages of semiconductors, on the basis of the following relationship with the Federal Reserve Bank of New York's Global Sup-

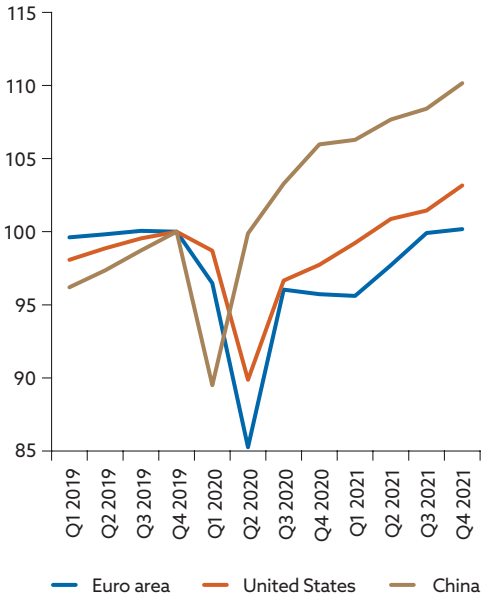
ply Chain Pressure Index (GSCPI) and the IMF's Commodity Net Export Price Index for Slovakia. In this way we managed to simulate the logistic and supply chain disruptions resulting from the war in Ukraine.

- Property prices increased by around 22% in the last quarter of 2021. Since that rate significantly outpaced income growth, housing availability declined, albeit only down to its long-term level. Another barometer of the housing market – the composite index to assess housing price developments – indicates that housing prices have reached a level where they are at high risk of correction.
- We attempted to discover 'Columbo's wife' – the equilibrium real interest rate (denoted as r*). In the case of Slovakia, the estimated equilibrium real interest has been negative for a decade, reflecting to a large extent higher savings in the economy. The estimation of r* as an unobservable variable is subject to uncertainty. Even after taking into account the whole range of uncertainty around the estimation, the natural interest lies well into negative territory.

2 Global economic situation and outlook

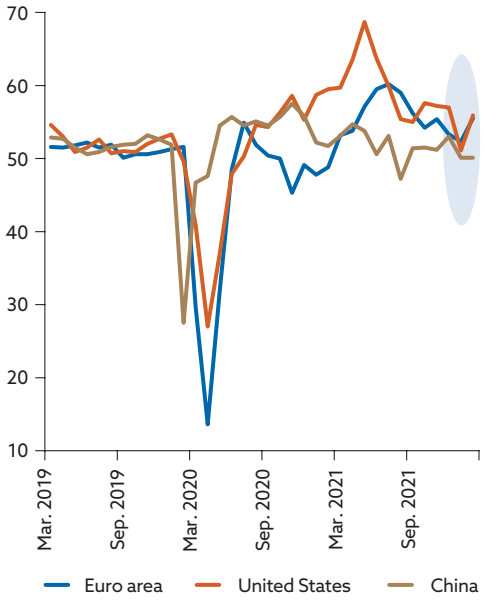
In late 2021 and early 2022 the global economy was adversely affected by the Omicron variant of the coronavirus (COVID-19). On the whole, however, its impact was far more moderate compared with previous waves, so the largest economies remained in growth in the last quarter of 2021 (Chart 1) and the Purchasing Managers' Index indicates a relatively rapid recovery (Chart 2).

Chart 1
GDP of selected economies (index: Q4 2019 = 100)



Source: Macrobond.

Chart 2
Composite Purchasing Managers' Index (PMI) (the level of 50 indicates stagnation)



Source: Macrobond.

In the euro area, economic growth was accompanied by a strengthening of the labour market in the fourth quarter of 2021. The market returned to pre-pandemic levels, with increases in both employment and hours worked (Chart 3). There was also a rise in the active population, i.e. the number of people who are employed or looking for work. The unemployment rate is at historically low levels (6.2% in January).

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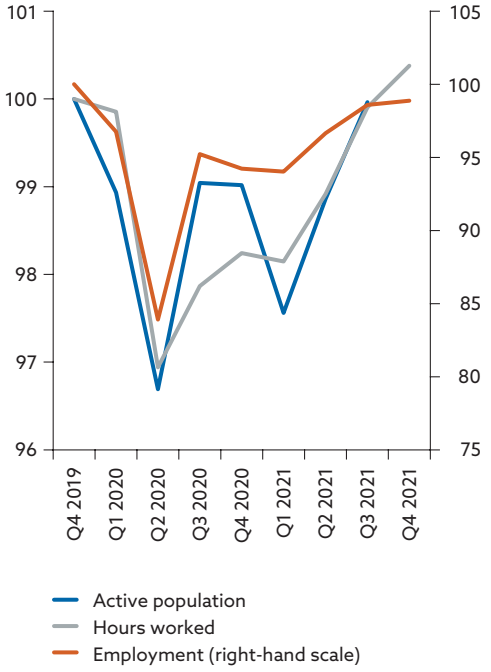
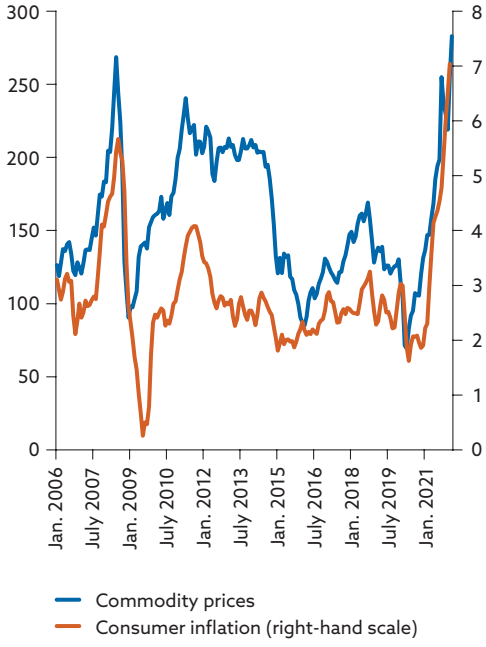
Chart 3
Labour market indicators (index: Q4 2019 = 100)



Source: Macrobond.

Chart 4
Global inflation and commodity prices (annual percentage changes)



Source: Macrobond.

Commodity markets have continued to see strong demand and reduced supply. This is reflected in the elevated prices of several commodities, including oil and natural gas, and the significant upward impact on inflation in many countries (Chart 4). Commodity price growth has been pushed up much more in recent weeks by the war in Ukraine.

In the euro area, energy prices are having the largest impact on headline inflation (Chart 5), accounting for more than half of overall price growth. However, core inflation is also increasing (Chart 6). Shortages of certain components are being reflected in durable goods prices in particular. Prices are also accelerating in services sensitive to the reopening of the economy (for example, services related to accommodation and package tours). Wage growth has so far remained moderate; nevertheless, despite the strengthening labour market, several indicators still point to the existence of labour shortages. At the same time, inflation is reducing household disposable income. In such a situation there is a heightened risk of increasing upward pressures on wages.

Looking at the world's large economies, demand-side pressures are most notable in the United States. This is also evident from the relatively small difference between headline and core inflation (Charts 5 and 6).

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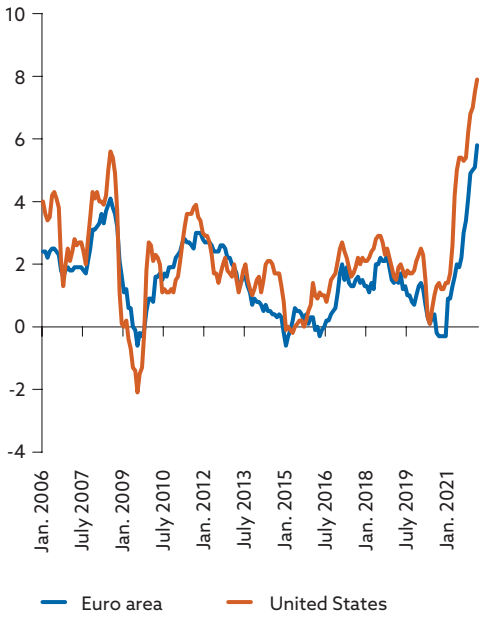
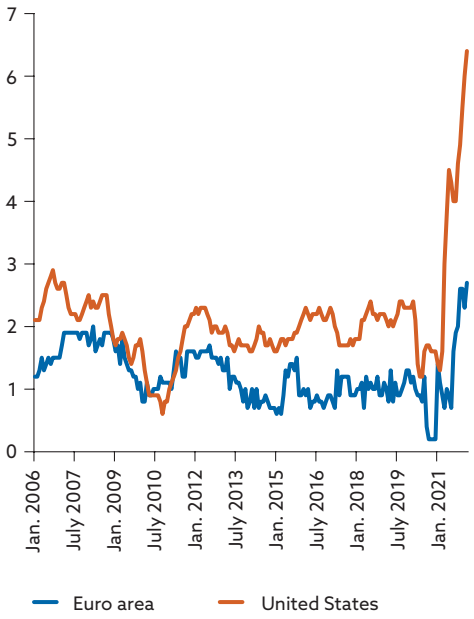
Chart 5
Headline inflation in the United States and the euro area (annual percentage changes)



Source: Macrobond.

Chart 6
Core inflation in the United States and the euro area (annual percentage changes)

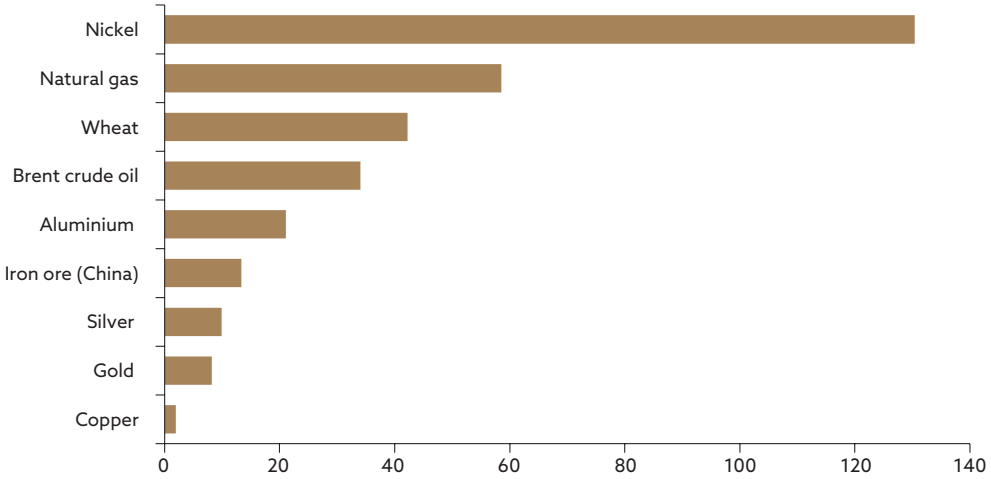


Source: Macrobond.

The war in Ukraine represents a new shock for a global economy that has still not recovered from the pandemic. These shocks are similar in nature, combining rising inflation and decelerating economic activity.

There has been a declining global supply of commodities constituting key inputs for many sectors of the economy. This has translated into large price increases in commodity markets (Chart 7). Not only have energy commodities been affected, so have, for example, metal and food commodities. Some 26% of the oil and 40% of the natural gas delivered to the European Union come from Russia. Russia and Ukraine are among the major global exporters of wheat, maize, and sunflower oil.

Chart 7
Growth in commodity prices since the start of 2022 (percentages)



Source: Macrobond.
Note: Daily data, last updated on 14 March 2022.

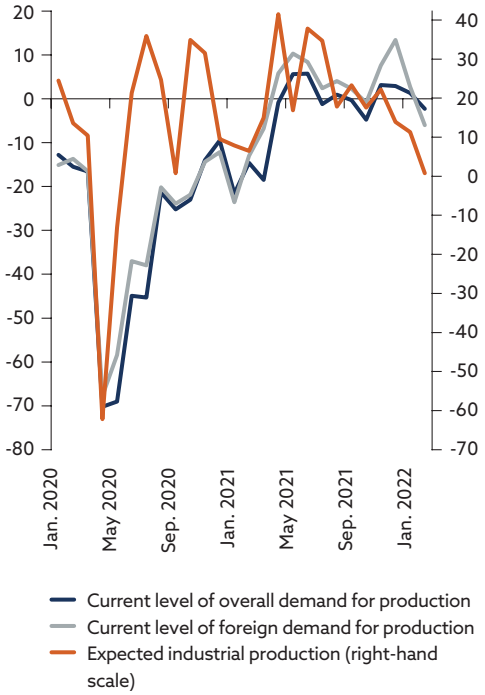
The result will be a further acceleration of inflation and probably a disruption of supply chains. This may be related either directly to the damage caused by the Russian invasion of Ukraine, or to the sanctions imposed in response to the invasion (including unilateral steps taken by certain major corporations). This, together with the weakening of confidence and the deterioration of trade flows with Russia, will weigh on global economic growth. The global inflation acceleration related to the effects of the war will affect real income and may dampen consumer demand. The search for alternative sources of oil and gas implies higher costs, as does the increasing need to use renewable energy sources. These costs are expected be a further source of price pressures.

The war in Ukraine will have considerable consequences for the global economy, though it would be premature to talk about stagflation. The initial war shock in financial markets was relatively strong. After a short time, however, the situation calmed and markets reappraised the expected developments. Equity markets rallied after the initial chaos and rebounded almost back to pre-invasion levels. Markets, it seems, expect that the global economic recovery will eventually continue. Likewise, real yield curves are not indicating long-term problems for the global post-pandemic recovery.

3 Baseline situation for Slovakia (pre-war scenario)

Even absent the war in Ukraine, Slovakia's economic growth would be lower than projected at the end of last year. In this scenario, we still envisage an improvement in semiconductor supplies, though our projection for their return to normal is shifted out to 2023. Moreover, we have revised down the assumption for significant market share gains driven by the release of global goods demand pent up during the pandemic period (Chart 8). There is evidence that non-automotive exports (Chart 9) have recently been lagging behind. Global goods demand probably stabilised earlier than we expected. With the reopening of all economies, the immediate unavailability of various goods accelerated the gradual higher use of services at the expense of goods.

Chart 8
Expectations in industry (percentage balances)



Source: European Commission.

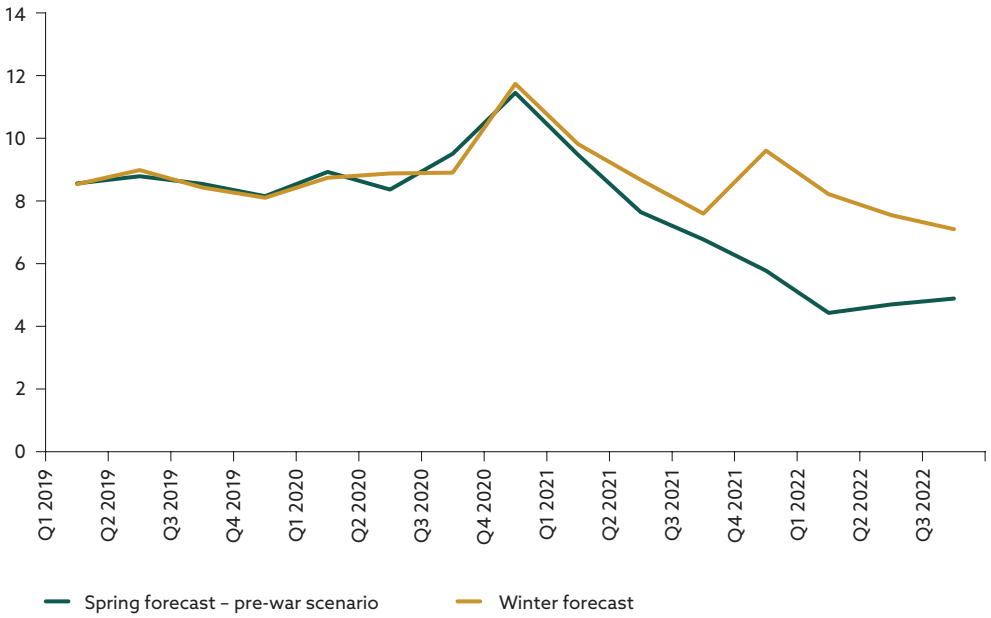
Chart 9
Foreign demand and exports (index: Q4 2019 = 100)

Sources: SO SR, and NBS calculations.

Another reason for lowering the projection for economic growth is consumer demand. The growth forecast for this demand has been revised down in response to the downward impact of inflation on household in-

comes. Furthermore, we saw better than expected developments in private consumption during the pandemic wave in late last year. In the winter 2021 forecast, we expected a greater decline and subsequent rapid rebound. The better situation was largely attributable to household savings (Chart 10), which meant there was far less scope in the subsequent period to use savings accumulated during the pandemic period.

Chart 10
Saving rate (percentage of disposable income)



Sources: SO SR, and NBS calculations.

The labour market remains stable. Despite the pandemic, employment increased moderately at the end of last year. Skilled labour shortages persist and are pushing up wages. Monthly indicators point to the labour market remaining resilient in early 2022. This is being signalled by surveys of firms. Job offer numbers are at record levels and there is no let-up in demand for skilled labour. Skilled labour shortages are weighing on corporate investment.

Cost factors are driving consumer price growth to be notably higher than projected in the winter 2021 forecast. High inflation will be with us for an extended period. Inflation is pervasive, with price rises being seen in almost all components of the consumption basket. Even before the outbreak of war in Ukraine, the market prices of gas indicated that next year would bring a further sharp hike in administered prices for households. Food prices have for several months now been rising faster than projected, owing mainly to the acceleration of producer prices in agriculture. Cost factors are passing through, with a lag, to other prices. This can be seen in prices of goods and services.

3.1 Potential scenarios for economic developments in Slovakia

The war in Ukraine has cast enormous uncertainty over the macroeconomic forecast. For this reason, we have produced two scenarios which differ mainly in their assumptions for the duration and extent of the war. In both scenarios, the economic situation in coming years is expected to deteriorate even further, with inflation accelerating and economic performance weakening.

In the better-case 'adverse scenario', economic growth over the projection period is estimated to range between 2% and 3%, with inflation peaking in 2023 at around 10%. In the 'severe scenario' there is a risk that the Slovak economy will temporarily stop growing.

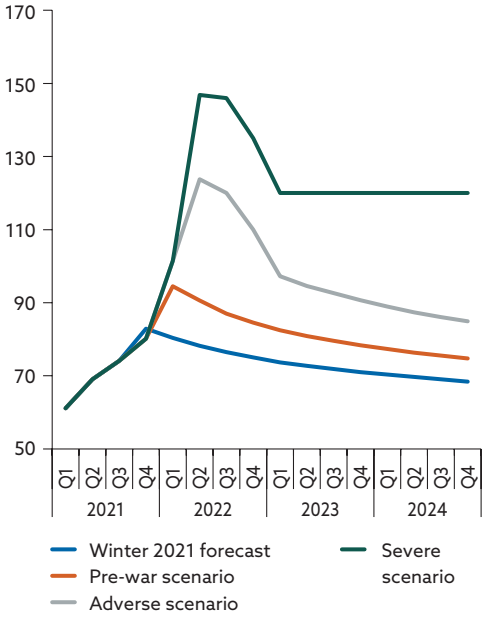
The adverse scenario assumes a shorter war, envisaging that the Russian invasion will have ended by summer 2022. Even so, the economic consequences of the conflict will be longer lasting. It is assumed that sanctions remain in force at least until the end of the year. As regards foreign trade, Slovakia's exports to Russia fall by 30%, as do other EU countries' exports to that country. These losses are partially reduced in 2024, but a proportion of the losses are permanent. In addition, there are also short-term supply chain disruptions. It is further assumed that the whole EU is disconnected from Russian energy commodity supplies in the short term (until approximately the end of 2022) and that the impact of gas shortages is mitigated by the application of the solidarity principle. Because of gas shortages, energy commodity prices rise sharply. Elevated volatility and uncertainty in financial markets have a short-term impact on investment. The economy is also affected by the wave of Ukrainian war refugees and the fiscal measures adopted in response. Some half a million refugees are estimated to arrive in Slovakia, with around one-tenth of that number applying for temporary refuge status. Given the demographic composition of the refugees, only a small proportion of them are likely to enter the Slovak labour market.

The severe scenario assumes a drawn-out war that could escalate still further in the short term. In this case, trade relations with Russia are permanently severed and supply chains are disrupted. The EU seeks to cease using energy carriers from Ruska, which cannot be completely replaced within coming quarters. Hence commodity prices increase further and remain at elevated levels for an extended period. Financial markets respond to this situation by raising risk premia, while in general the cost of borrowing increases for all sectors of the economy. In this scenario, with the war not abating and even escalating, the inflow of refugees is higher. Com-

pared with the adverse scenario, the refugee inflow is reflected to a greater extent in fiscal support and in labour market indicators.

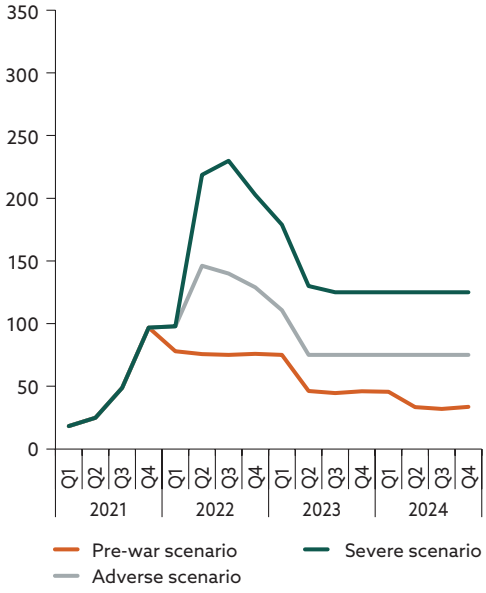
In Slovakia, the main economic consequence of the war in Ukraine is expected to be higher prices. Even before the invasion, energy prices in Europe were elevated and were sapping a large proportion of households' income and savings. In the wake of the Ukraine war shock, price pressures are expected to intensify even further (Charts 11 and 12) and will therefore weaken consumer demand in both Slovakia and Europe as a whole.

Chart 11
Oil price level in USD/barrel



Sources: Macrobond (futures), and NBS calculations.

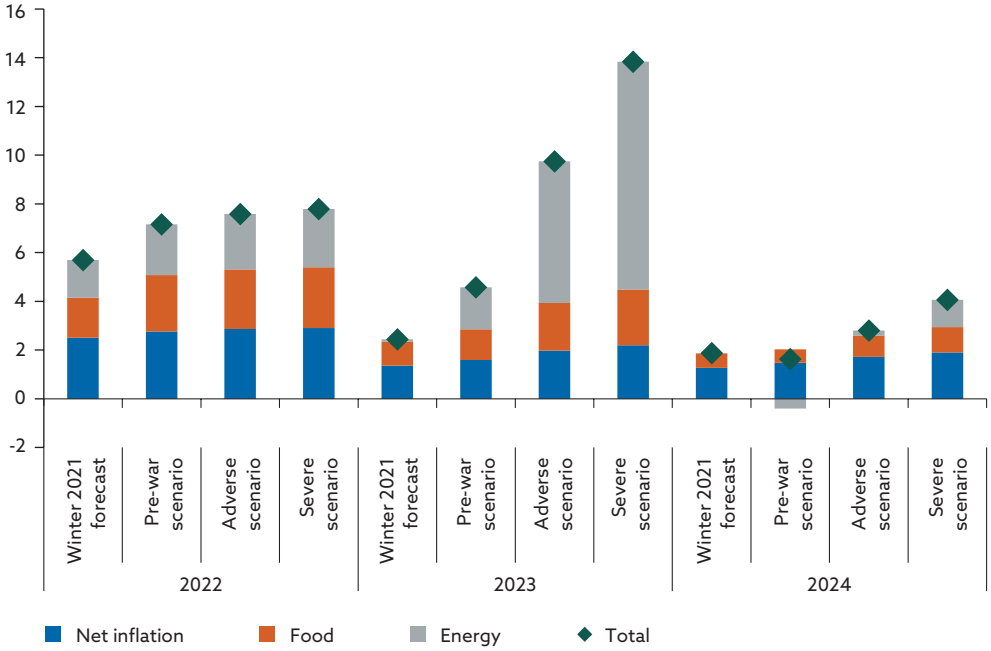
Chart 12
Gas price level in EUR/MWh



Sources: Macrobond (futures), and NBS calculations.

Inflation is expected to remain just below 8% in 2022, while in the following year, under the scenarios factoring in the war in Ukraine, it is envisaged to accelerate to between around 10% and 14% (Chart 13). The largest upward revision in 2023 stems from the framework applied by the Regulatory Office for Network Industries when setting administered energy prices. On the basis of market gas prices, we assume that, absent compensation measures, administered energy prices could increase by between around 40% and 60% and therefore account for the most significant contribution to headline inflation in 2023. It should be noted, however, that higher global prices of commodities (energy and agricultural) also pass through indirectly to other prices in the economy. We therefore envisage relatively high increases in net inflation and food inflation. Headline inflation is projected to decelerate in 2024, with the rate falling to between 2% and 4%.

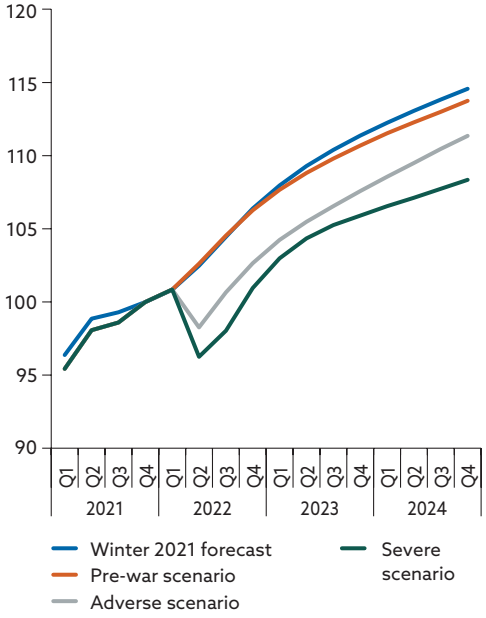
Chart 13
Inflation projection (annual percentage changes)



Sources: NBS calculations.

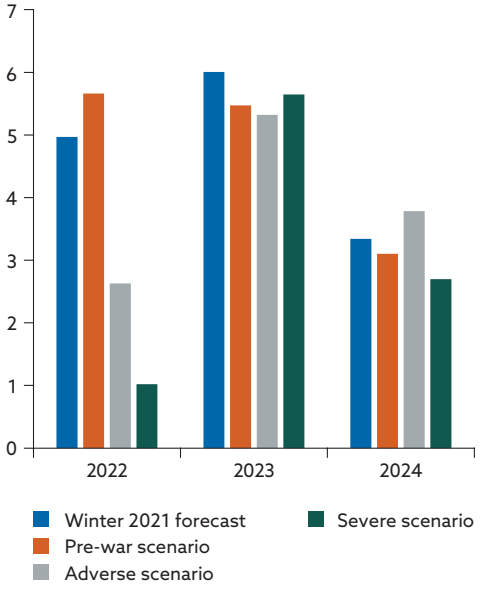
Compared with the winter 2021 forecast, foreign demand is projected to decline by a cumulative 2.1% in the adverse scenario, and by 4.3% in the severe scenario (Charts 14 and 15). Besides the direct impact of reduced foreign trade with Russia and supply chain disruptions, we have also taken into account an indirect channel through our trading partners' links with Russia.

Chart 14
Level of foreign demand (index: Q4 2021 = 100)



Source: NBS calculations.

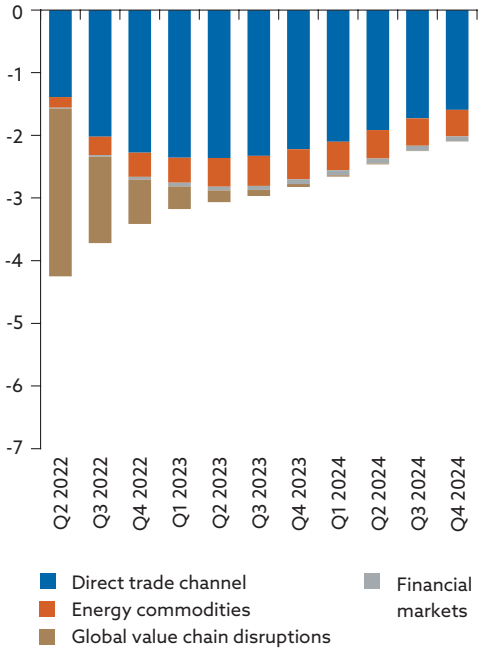
Chart 15
Foreign demand growth (annual percentage changes)



Source: NBS calculations.

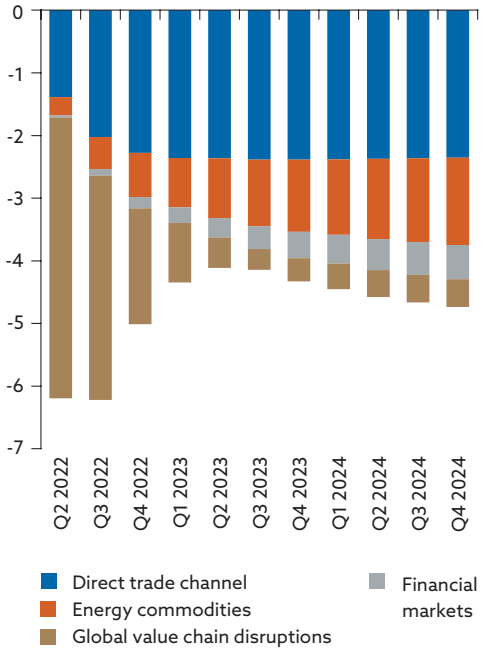
Over the projection period, it will be the direct and indirect trade channels that have the largest impact on revisions to projected growth in foreign demand for Slovak goods (Charts 16 and 17). In coming months, however, the adverse impact of disrupted supply chains will predominate. In the severe scenario, their impact remains significant until the end of 2022.

Chart 16
Foreign demand in the adverse scenario (change in level versus the pre-war projection; percentages)



Source: NBS calculations.

Chart 17
Foreign demand in the adverse scenario (change in level versus the pre-war projection; percentages)



Source: NBS calculations.

The negative impact of supply chain disruptions on expert growth in 2022 is estimated to be between 1.5 and 3.0 percentage points (see Box 1 for more details). We modelled this estimate using the Federal Reserve Bank of New York's Global Supply Chain Pressure Index (GSCPI) and its impact on export performance. The war scenarios, however, assume a temporary deterioration in coming weeks that has a downward impact on exports.

Box 1
Estimating the impact of supply chain disruptions on export performance

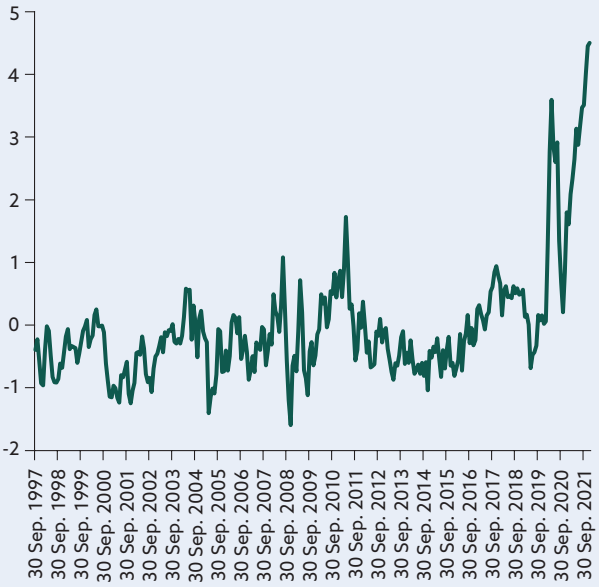
After easing briefly in late 2021 and early 2022, global supply bottlenecks are again mounting in the wake of the war in Ukraine and are severely hampering the global economy's post-pandemic recovery. Not only will the global transport market be disrupted, but so will production, resulting in further shortages of components.

The impact of global value chain (GVC) disruptions on Slovak exports is estimated based on the following relationship with the Federal Reserve Bank of New York's Global Supply Chain Pressure Index (GSCPI)[1] and with the IMF's Commodity Net Export Price Index for Slovakia ('*commodity_ToT*'),[2]

$$\Delta^4 \log(real\_export_t) = 0.07^{***} - 3.35^{***}\Delta^4 \log(commodity\_ToT_t) - 0.025^{**}\Delta^4 GSCPI_t,$$

where Δ^4 is the difference between periods t and t-4, $real\_export_t$ is Slovakia's real exports at time t, and the asterisks denote statistical significance (*** 99%, ** 95%). The sample period ranges from Q3 1997 to Q4 2021.

Chart A
Global Supply Chain Pressure Index, September 1997 to February 2022 (standard deviation from the mean)



Source: NBS calculations.

Chart B
The IMF's Commodity Net Export Price Index for Slovakia (January 2019 = 100)

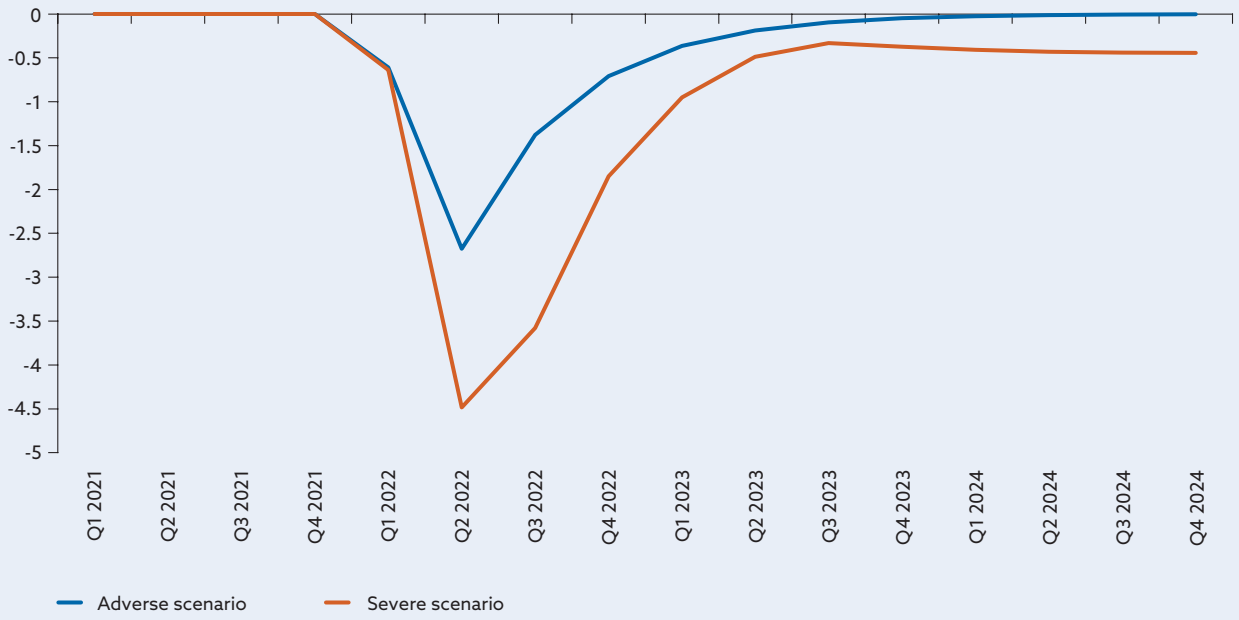
Source: NBS calculations.

The estimated losses in Slovak exports resulting from component shortages and supply bottlenecks, expressed in the form of the GSCPI assumed in the individual scenarios, are as follows:

[1] Benigno, G., Di Giovanni, J., Groen, J. and Noble, A., "Global Supply Chain Pressure Index: March 2022 Update," Federal Reserve Bank of New York *Liberty Street Economics*, 3 March 2022.

[2] The Commodity Net Export Price Index represents the price ratio of commodities exported and imported by Slovakia weighted by ratio of net exports to GDP and using rolling weights.

Chart C
Export levels as a deviation from the pre-war scenario (percentage points)



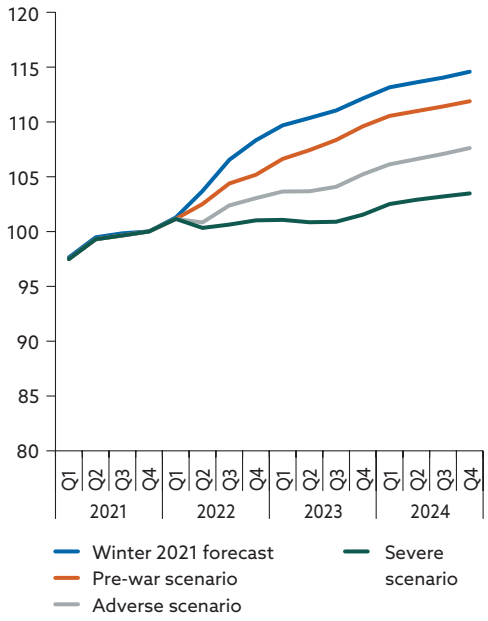
Source: NBS calculations.

Table A Losses in Slovak exports up to the end of 2024 (EUR millions)	
Owing to component shortages under the pre-war scenario in the years 2021–22	4,068
Additional losses under the adverse scenario	1,564
Additional losses under the severe scenario	3,770

Source: NBS calculations.

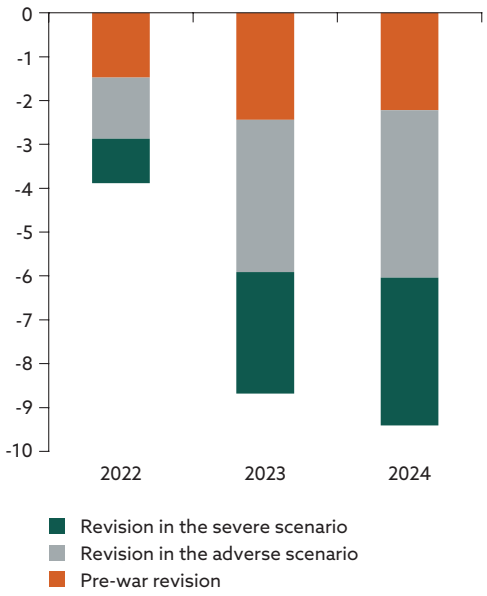
As a result of the war in Ukraine, the Slovak economy is estimated to experience a cumulative loss of between 4% and 7% over the projection period (Charts 18 and 19). Downward revisions to economic growth projections will have a lagged negative impact on employment growth projections. The current labour market tightness will moderate, but there will continue to be excess demand for labour. The extent to which migration will meet that demand is expected to be limited, given the age structure of the Ukraine war refugees. Many of them will remain outside the labour market. Wages are expected to respond sluggishly to price developments. No significant upward revision of wage growth is expected this year. In 2023 wage demands in collective bargaining will increase and wage growth is projected to accelerate. Inflation, however, is expected to remain elevated both this year and next year, thereby reducing households' purchasing power. Real incomes are expected to start improving again in 2024.

Chart 18
Economic activity outlook (level; index: Q4 2021 = 100)



Source: NBS calculations.

Chart 19
Revision of GDP growth projection compared with the winter 2021 forecast (percentage points)



Source: NBS calculations.

Fiscal policy could help limit the impact of the war on the economy. Measures to stabilise energy prices, as well as general government transfers to households (increasing their disposable income), would to some extent mitigate the negative impact on households' purchasing power and thereby prevent a decline in consumer demand next year.

4 Public finances

As regards their impacts on fiscal performance, the scenarios cause deviations from the expected level of public finance consolidation in coming years. While the 2021 outturn is expected to outperform NBS's winter 2021 forecast, a combination of rising energy prices, decelerating economic growth, and spending on refugees is expected to have a gradual adverse impact on fiscal performance. Depending on the extent to which the war scenario assumptions materialise, the fiscal deficit is projected to be between 3.6% and 4.2% of GDP in 2022 with measures at their current size. The impact of rising prices, in particular on social expenditure, is not expected to be significant until the following years. The deficit in 2024 is envisaged to be between 4.3% and 5.7% GDP.

The deterioration in public finances will be at the expense of expenditure. Rising prices together with higher wage indexation will contribute to an overall increase in tax and social security contribution revenues. With this growth expected to be tempered by the cooling of the real economy, the overall revision of economic growth is not expected to have a significant impact on public revenues.

On the other hand, current expenditure will increase sharply. With prices accelerating, it is expected that wage indexation will increase appreciably, that energy prices will increase spending on goods and services, and that social spending will be indexed to a greater extent.

Besides being under pressure from the direct impact of high energy prices, public funds will need to be increased for expenditure related to the influx of war refugees and deliveries of humanitarian aid. We estimate that **unless this expenditure is covered by the EU budget**, the fiscal deficit in 2022 could deteriorate by between 0.3% and 0.7% of GDP.

Capital expenditures will continue to rely heavily on funding from the EU, whether from standard EU funds or, through the implementation of Slovakia's recovery and resilience plan (RRP), from the EU's Recovery and Resilience Facility (RRF). Public investment is expected to have doubled by the end of the projection period, driven mainly by EU-funded projects and the take-up of funding provided under the RRP. Investments from own resources are also expected to increase, though not to the extent that they would contribute significantly to overall investment growth. Compared with previous projections, the planned postponement of an import of military equipment is expected to have a positive impact on fiscal performance next year.

Public debt is projected to rise to 63% of GDP in 2021. Deficit financing needs and rising general government deposits[3] contributed to public debt increasing in 2021 by more than €6 billion year on year. The debt is expected to continue rising in subsequent years, albeit more moderately. Depending on the extent to which the scenarios materialise, public debt is projected to be between 61.2% and 62.2% of GDP in 2022 and between 59.2% and 63.2% of GDP at the end of the projection period.

Table 2 Key macroeconomic indicators in the forecast scenarios (annual percentage changes; fiscal variables as a percentage of nominal GDP)

	Winter 2021 forecast			Pre-war scenario			Adverse scenario			Severe scenario		
	2022	2023	2024	2022	2023	2024	2022	2023	2024	2022	2023	2024
GDP	**5.8**	**5.6**	**2.7**	**4.2**	**4.5**	**3.0**	**2.8**	**2.3**	**2.6**	**1.7**	**0.3**	**1.9**
Private consumption	4.2	3.8	2.2	3.2	1.8	2.3	2.9	-1.3	1.3	2.2	-4.1	0.4
Public consumption	-1.2	1.9	2.4	-4.3	1.8	2.8	-3.5	0.7	2.5	-2.0	-0.1	2.5
Fixed investment	13.4	17.1	0.8	17.3	12.6	3.8	13.7	8.9	3.8	12.2	4.9	3.0
Goods and services exports	8.5	7.7	5.2	5.9	5.6	5.5	3.0	5.3	6.1	1.0	5.0	5.2
Employment	**1.1**	**1.5**	**0.4**	**0.9**	**1.1**	**0.2**	**0.8**	**0.8**	**-0.2**	**0.6**	**-0.3**	**-0.5**
Wage level	**6.3**	**6.7**	**4.9**	**7.0**	**7.2**	**5.1**	**6.9**	**9.2**	**5.7**	**6.7**	**11.0**	**6.2**
HICP inflation	**5.5**	**2.4**	**1.9**	**7.2**	**4.6**	**1.6**	**7.6**	**9.7**	**2.8**	**7.8**	**13.8**	**4.1**
General government deficit	**-3.8**	**-3.1**	**-2.9**	**-3.2**	**-2.3**	**-3.2**	**-3.6**	**-2.8**	**-4.3**	**-4.2**	**-3.8**	**-5.7**
General government debt	**59.2**	**55.9**	**55.3**	**60.4**	**57.1**	**56.7**	**61.2**	**58.7**	**59.2**	**62.2**	**61.0**	**63.2**
Foreign demand	**5.0**	**6.0**	**3.3**	**5.7**	**5.5**	**3.1**	**2.6**	**5.3**	**3.8**	**1.0**	**5.6**	**2.7**

Source: NBS calculations.

[3] Under the ESA 2010 methodology, private sector deposits at the State Treasury are included in public debt.

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Special annex 1

The impact of natural gas supply restrictions

Besides entailing a humanitarian catastrophe, the Russian invasion of Ukraine will also have adverse economic effects. Russia is a major supplier of raw materials. With the introduction of sanctions on Russia, these supplies could be jeopardised. In the case of natural gas, Slovakia is heavily dependent on gas imports from Russia (they accounted for 85% of total natural gas imports in 2020). Moreover, the gas pipeline runs through the territory of Ukraine, where the war is being waged. Natural gas is a relatively important energy commodity, one that is not simple to replace. Some 14% of the energy needs of the entire Slovak economy are met by natural gas. Any shortage of gas will therefore inevitably have an upward impact on its price. If the availability of gas is restricted, GDP will be adversely affected.

In the case of a 20% reduction in natural gas imports, real GDP is estimated to decline by between 0.6% and 1.4% under alternative estimations based on the production function or the interdependence of sectors. Assuming a gas price increase of 185%, industrial producer prices are estimated to increase by 1.9%. According to whether the baseline prices of gas are lower or higher, corresponding to different offtake bands, the impact on the price level ranges between 1.6% and 2.6%.

Industrial sectors have the highest natural gas intensity, whether direct or indirect (taking into account intersectoral links). The industries shown in Chart 1 are selected on the basis of having gas intensity higher than that of total GDP, i.e. 2 TJ/EUR million. Direct supplies of natural gas to the four industries constitute 42% of total gas consumption.[1, 2]

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[1] The input-output table for 2014 from the World Input-Output Database project: Timmer, M. P., Dietzenbacher, E., Los, B., Stehrer, R. and de Vries, G. J., "An Illustrated User Guide to the World Input–Output Database: the Case of Global Automotive Production", *Review of International Economics*., Vol. 23, No 3, 2015, pp. 575–605.
The input-output table was recalculated from USD to EUR using the exchange rate from the same source.

[2] An advantage of the World Input-Output Database is that the input-output tables are accompanied by satellite environmental accounts, which include energy consumption in TJ for the same periods and in the same sectoral breakdown: Corsatea, T.D., Lindner, S., Arto, I., Román, M.V., Rueda-Cantuche, J.M., Velázquez Afonso, A., Amores, A.F. and Neuwahl, F., "World Input-Output Database Environmental Accounts; Update 2000-2016"

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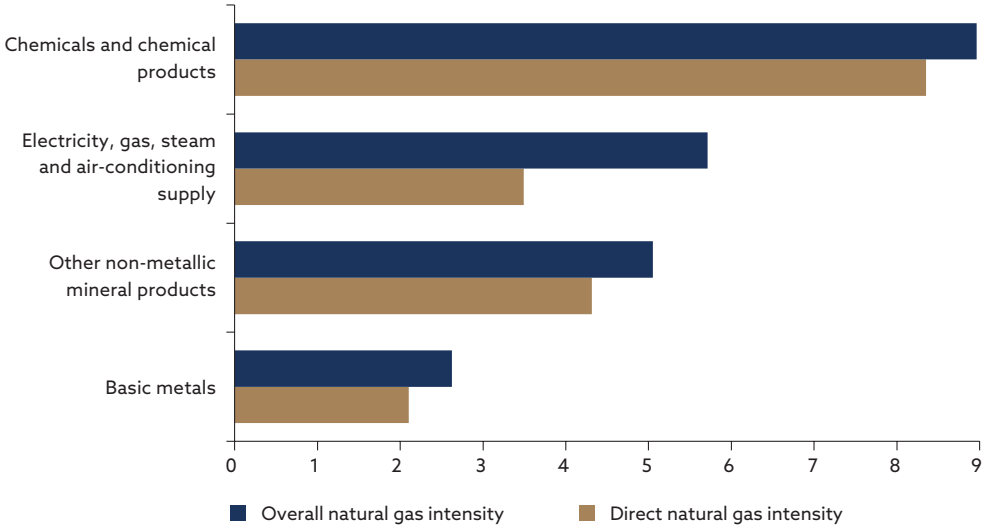
Chart 1
Natural gas intensity of EUR 1 million of industry production (in TJ)



Sources: World Input-Output Database[1], environmental accounts[2], and NBS calculations.

In industries with the most natural gas intensive production, replacing gas with other energy sources could be more difficult than in other industries. In the estimation of the impact of **a 20% reduction in gas supplies,** it is assumed that final production in the four sectors with the highest gas intensity will decrease to the same extent.

In the adverse scenario presented here, it is positive to note that the **industries with the highest natural gas intensity have relatively lower value-added intensity**[3] (Chart 2). This attribute moderates the **GDP loss** reaching **1.4%.**

,*Publications Office of the European Union*, Luxembourg, 2019, ISBN 978-92-76-02068-4, doi: 10.2760/024036, JRC116234.

[3] The sum of value added, taxes less subsidies for products, and international transport margins serves as a proxy for GDP.

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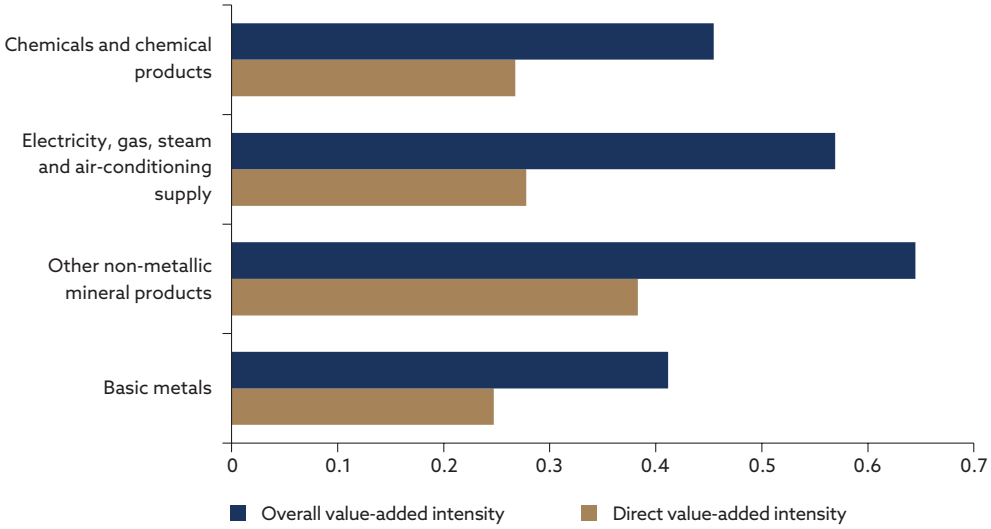
Chart 2
Value-added intensity of industries



Sources: World Input-Output Database,[1] and NBS calculations.
Note: Value-added intensity – the number of units of value added necessary to produce one unit of the industry's overall output. The average direct intensity across the industries is 0.5 and the overall intensity is 0.7 (taking into account also the value added embedded in intermediate inputs from other industries).

Another way to estimate the impact of gas supply reduction, besides from a sectoral perspective, is by using an approach[4] based on the share of natural gas expenditure in total GDP. The change in GDP will be higher where the share of gas expenditure in GDP is elevated. The impact on GDP is further accentuated by the upward impact of gas price growth on gas expenditure as a share of GDP. The more difficult it is to replace gas with other inputs, the greater the gas expenditure increase. This is because the volume of gas consumed cannot be sufficiently reduced when the gas price rises.

The estimation assumed that the gas price increases on average by 2.8 times over the projection period. Gas expenditure[5] as a share of GDP at current prices more than doubles[6] from its 2020 base level of 2% of GDP. The in-

[4] The elasticity of real GDP to the amount of gas depending on the share of gas expenditure in nominal GDP and on the change in the given share is derived from the production function in the following paper: Bachmann, R., Baqaee, D., Bayer, C., Kuhn, M., Löschel, A, Moll, B., Peichl, A., Pittel, K. and Schularick M., "What if? The Economic Effects for Germany of a Stop of Energy Imports from Russia", *ECONtribute Policy Brief*, No 028, March 2022.
The change in the share of gas expenditure in GDP includes information about the weight of gas and about the elasticity of its substitution in the production function. This expresses how difficult it is, in production, to substitute natural gas with other inputs.

[5] This takes into consideration the amount of natural gas consumed by households and non-household consumers, as well as the respective prices for the aggregate of all offtake bands according to Eurostat's energy statistics.

[6] In fact, gas supply restrictions may also cause a change in nominal GDP, though with only a negligible impact on the results. If, for example, GDP at current prices fell by 5%, the increased gas expenditure share in nominal GDP would amplify the negative impact on real GDP by only 0.02 percentage points.

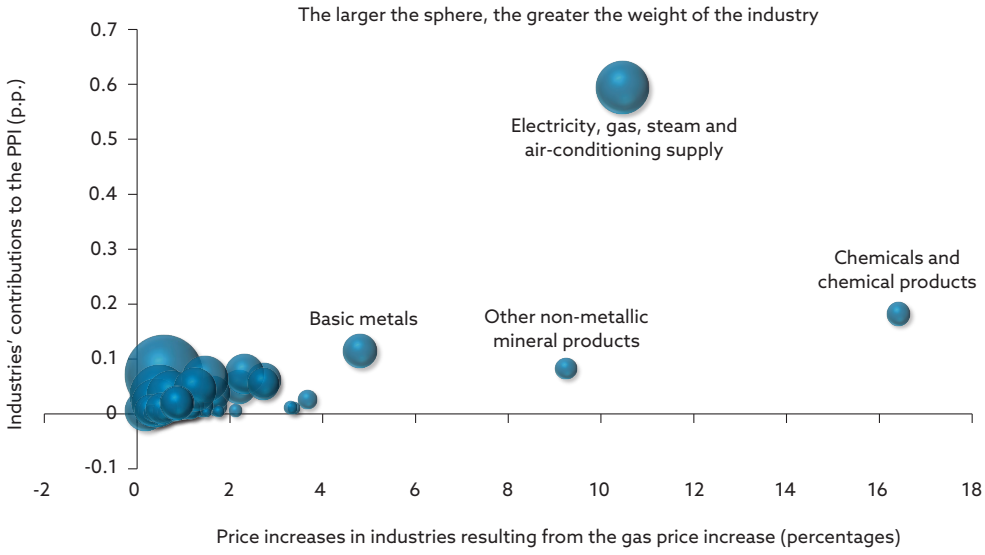
crease in that share is slower where it is assumed that **the volume of gas supplied falls by 20%.** Even so, the impact of the higher gas price predominates, with the result that **GDP declines by 0.6%.**

A natural gas price increase also has an impact on industrial producer prices, as measured by the producer price index (PPI). The producer prices of particular industries are upwardly affected by the industries' gas intensity. In any given industry, the producer price is affected by direct intensity stemming from gas consumption. Moreover, the price may be indirectly increased by the rising cost of inputs from other industries in which prices are also being pushed up by costlier gas. The overall impact on an industry is captured by its overall gas intensity (Chart 1).

The level of industries' contributions to the PPI for the whole economy also reflects industries' weights, which for each industry reflect the share of its output in the economy's overall output. The industry that has the largest upward impact on the PPI when the gas price rises is *electricity, gas, steam and air-conditioning supply*. Because this industry has the second highest total gas intensity, the price of its production increases. At the same time, it has a relatively large share in overall economic output (Chart 3). The relatively low weight of *chemicals and chemical products* means that it ranks behind *electricity, gas, steam and air-conditioning supply* despite having higher gas intensity. In terms of their impact on the PPI, the other two sectors under review – *basic metals* and *other non-metallic mineral products* – undergo a similar switch in ranking (Chart 4).

Chart 3

Price increases in industries resulting from a 185% gas price increase, and industries' contributions to the PPI (percentages; percentage points)

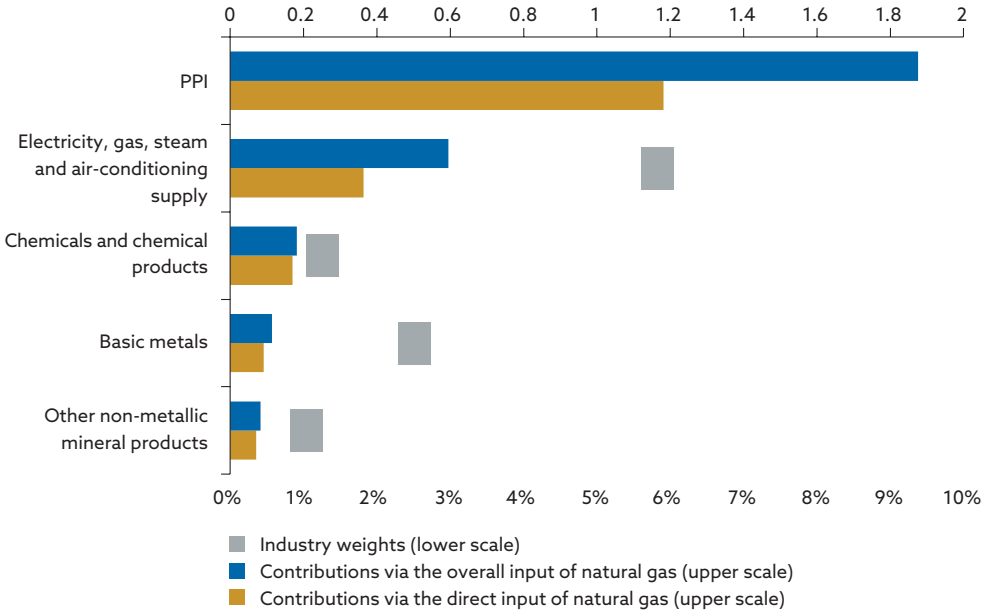


Sources: World Input-Output Database,[1] environmental accounts,[2] Eurostat, and NBS calculations.

The projection scenario assuming a longer-lasting conflict in Ukraine includes **the gas price increasing by 185%** on average over the projection period. **The producer price index is estimated to increase by 1.9%.** More than half of that increase is accounted for by the four most gas intensive sectors, even though their aggregate contribution to overall economic output is only 10%.

Chart 4

PPI increase resulting from a 185% gas price increase (percentages); the industries with the largest contributions (percentage points) and their weights (percentages)



Sources: World Input-Output Database,[1] environmental accounts,[2] Eurostat, and NBS calculations.

The calculation in monetary terms of gas as a share of industries' output uses the gas price in the median offtake band[7] for non-household gas consumers. At a higher baseline price, natural gas would constitute a higher share of industries' output prices and the impact on the PPI would be greater. Chart 5 shows alternative impacts on the PPI under a higher gas price of 13.74 EUR/GJ in the lowest offtake band and under a lower price in the highest available offtake band[8] (8.29 EUR/GJ instead of the baseline price of 9.91 EUR/GJ). The PPI increase resulting from a 185% gas price increase ranges between 1.6% and 2.6%.

[7] For 2014, the year of the input-output table's most recent data on inter-industry flows, gas price data for the aggregate of all offtake bands are not available.

[8] The data used are for the lowest offtake band I1 and for the second highest band I5. Data for the higher band I6 are not released owing to their confidentiality.

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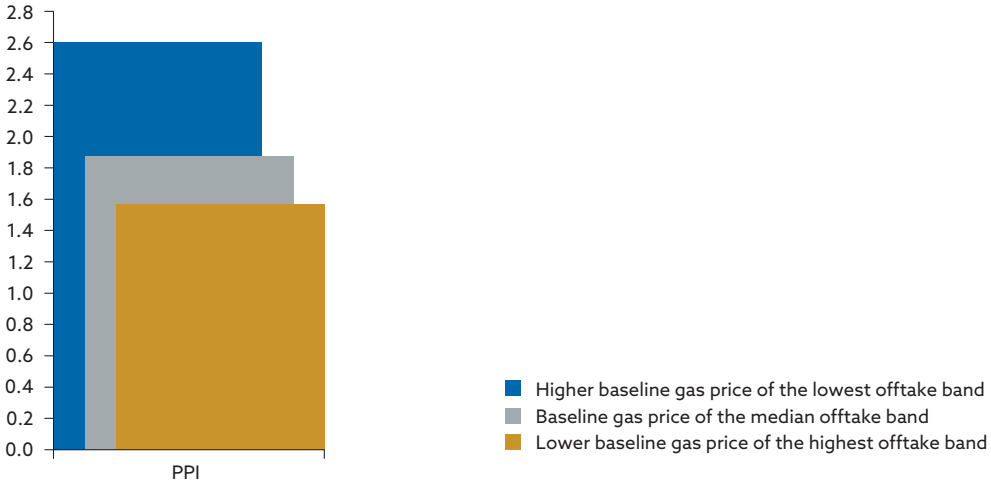
Chart 5

Impact of a 185% gas price increase on a PPI increase under alternative baseline gas prices (percentages)



Sources: World Input-Output Database,[1] environmental accounts,[2] Eurostat, and NBS calculations.

Firms will not adjust immediately to gas market restrictions. In time, the economy is expected to be able to cope with the envisaged drop in natural gas supplies, especially if assistance is targeted to the hardest-hit industries and to low-income households. Since an already relatively high share of these households' expenditure on housing is further influenced by the price of gas, they are more adversely affected. At the same time, gas constitutes as much as 35% of the overall direct energy consumption of households, while its share in the energy consumed in production across all sectors of the economy other than households is 12%. Consumer prices could therefore be more sensitive to gas prices than producer prices, though consumer gas prices are administered. A natural gas shortage is, moreover, an opportunity to invest in alternative energy sources. If the gas price is high, new energy sources will be more cost-effective. Alternative energy sources are also expected to help reduce emissions and moderate global warming.

There may be a risk that gas imports fall more sharply, that sectors less dependent on natural gas also become affected by production losses, or that a higher gas price increases the share of expenditure spent on gas to an even larger extent. Such outcomes would mean a more pronounced decline in economic activity and a sharper rise in prices.

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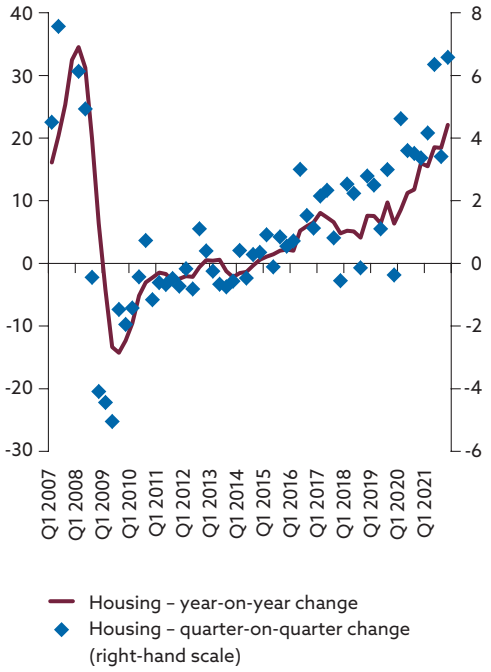
Special annex 2

Housing price developments: an analytical view

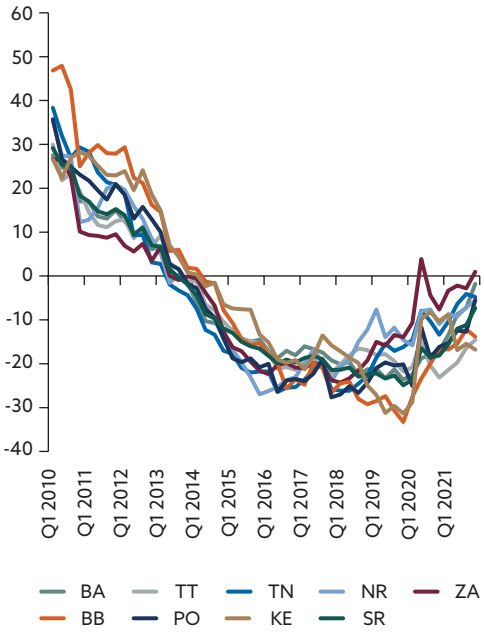
Housing prices increased by 6.6%, quarter on quarter, in the fourth quarter of 2021. The annual rate of growth was 22.1% (Chart 1). The fourth quarter was the only quarter in 2021 when prices of flats outpaced those of houses. Price increases were accompanied by significant declines in supply. The strongest housing price growth was in Prešov and Bratislava regions.

Chart 1
Average housing prices (percentages)



Source: NARKS.

Chart 2
Housing affordability index (HAI) value as a ratio of its historical average (percentages)



Sources: NBS, NARKS, and SO SR.

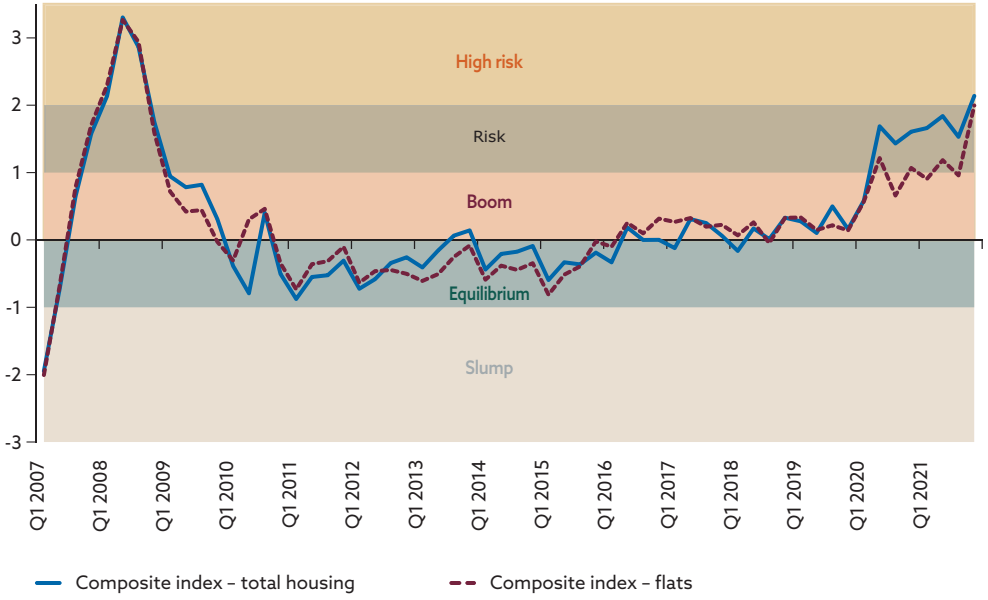
The evolution of the housing affordability index (HAI)[1] shows a gradual downward trend in housing affordability (Chart 2). The impact of accelerating housing prices in the fourth quarter was somewhat dampened by

[1] The HAI calculation is based on a so-called adequate income derived from the current average cost of mortgage loan servicing (taking into account current housing prices and interest rates). The adequate income is compared with the wage level on a region-by-region basis. The final ratio is then interpreted in relation to the long-run average.

favourable wage developments. As a result, the HAI increased more slowly than housing prices themselves. Affordability nevertheless deteriorated, in particular in Prešov, Bratislava, and Žilina regions (the HAI in Žilina region exceeded its long-term average). Interest rate movements had only a limited upward impact on housing affordability in the fourth quarter.

The composite index to assess housing price developments[2] rose significantly in the fourth quarter of 2021 (Chart 3)**, moving into the band indicating a high risk of price correction.** All components – most notably the price-to-rent ratio, price-to-income ratio, and real prices – contributed to the increase. After almost two years, the gap between the overall composite index and the index for assessing primarily prices of flats was closing, owing to the acceleration of those prices in late 2021.

Chart 3
Composite index to assess housing price developments



Sources: NBS, NARKS, and SO SR.

In the fourth quarter of 2021 rental prices recorded their first year-on-year increase since early 2020, rising by 2.6% (Chart 4). This, however, was mainly due to a base effect. In quarter-on-quarter terms, rental prices recorded a slight decline. They remain 15% below pre-pandemic levels. Com-

[2] In order to assess the impact of housing prices on financial and economic stability, we compare their evolution with the evolution of their underlying theoretical fundamentals. We do so using a composite index based on ratio indicators (the real housing price; price/income; price/rent; housing loans/households' gross disposable income; amount of residential construction/GDP). Further information on the composite index's compilation is provided in Cár, M. and Vrbovský, R., "Composite index to assess housing price development in Slovakia", Biatec, Vol. 27, No 3, Národná banka Slovenska, Bratislava, 2019.

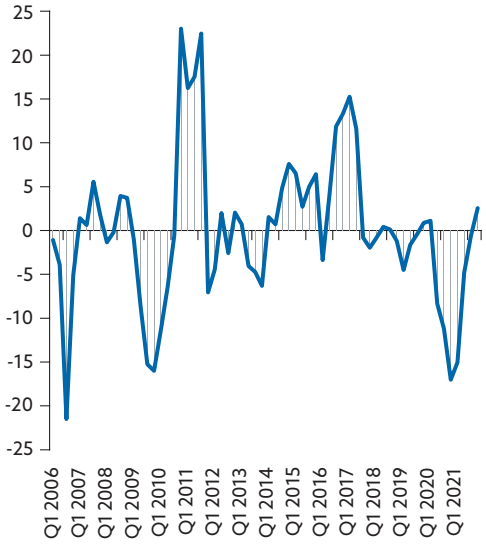
pared with renting, it seems that buying residential property is relatively more expensive than in the past.

Residential construction was 9% higher in the fourth quarter of 2021 than in the same period of 2020. After gradually returning towards pre-pandemic levels, it stood 5.5% below its level in the fourth quarter of 2019. Building permits and flat construction starts continue to increase. At the end of the fourth quarter, the number of flats under construction reached its highest level since the data series began (in 2003). The higher construction activity indicates a relative overheating of the real estate market.

The net increase in housing loans (Chart 5) **peaked in December.** It remained elevated throughout the fourth quarter. The ratio of housing loans to disposable income is having an upward impact on the composite index. January 2022 saw a markedly lower increase in new mortgage loans, though this slowdown was due more to seasonal factors.

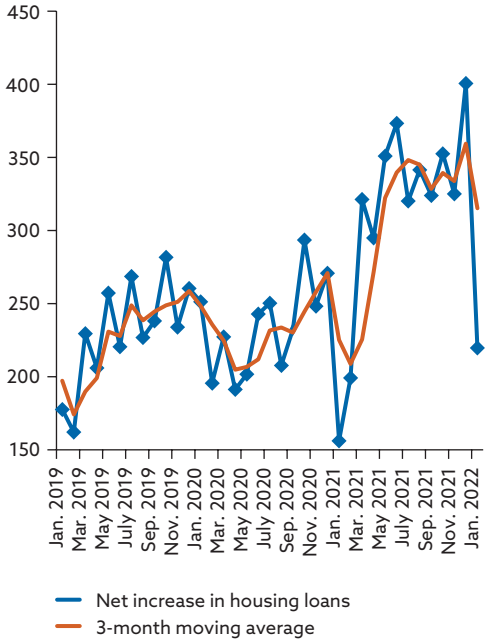
Incoming banking data for the first quarter of 2022 point to an increase in interest rates. This information, the construction sector data, and the overall rise in market uncertainty indicate the possibility of a housing price correction.

Chart 4
Average rental prices (annual percentage changes)



Source: NARKS.

Chart 5
Net increase in housing loans (EUR millions)



Source: ECB.

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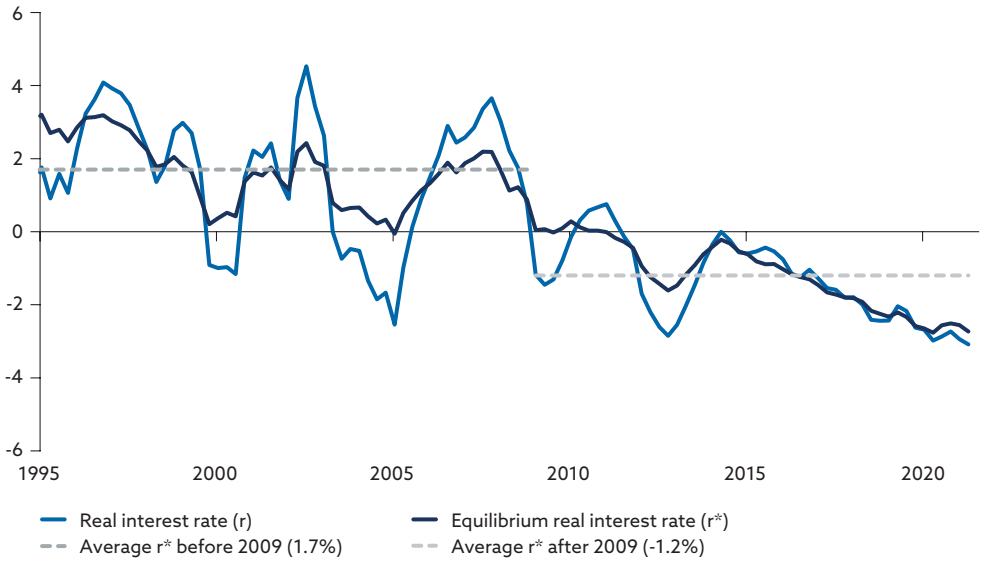
Special annex 3

The equilibrium interest rate and its estimation and implications

The equilibrium interest rate is a key parameter for monetary policy. It is a long-term variable since it determines the general rate of return on investment in the economy. Because this rate is the difference between the nominal interest rate and the inflation rate for an economy in equilibrium, it is also known as the natural interest rate. Like 'Columbo's wife', it has never been seen. In other words, it is an unobserved variable and therefore can only be estimated.

Monetary policy aims to set the key interest rate close to the equilibrium real rate (r*) under existing inflation expectations, so as to endure equilibrium over the medium- to long-term. In practice, however, a situation may arise where the equilibrium interest rate falls below 2%. In that case, standard monetary policy is not able to achieve that level without applying a negative key interest rate. In order to overcome such constraints, central banks resort to unconventional monetary policy measures.

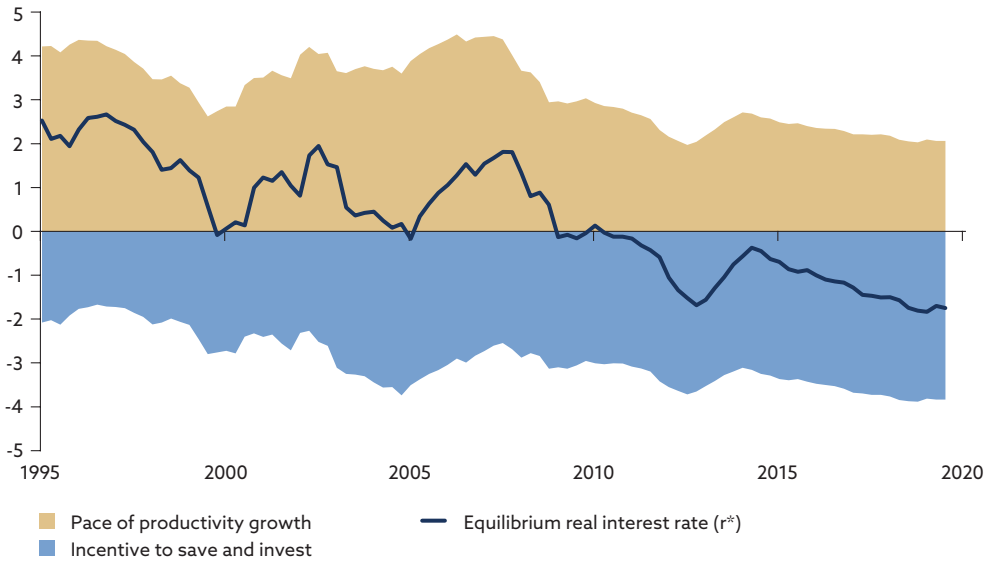
Chart 1
Real interest rate (r) and equilibrium real interest rate (r*)



Source: NBS.
Notes: The real interest rate (pale blue solid line) is calculated as the difference between the three-month EURIBOR and the annual moving average of the HICP. The equilibrium interest rate (dark blue dashed line) is the equilibrium real interest rate based on a simulation model presented in Kupkovič (2020).

We look at r* from a medium-term perspective,[1] where r* is consistent with an economy in equilibrium, i.e. with real GDP at its potential level and the inflation rate at its target level after all the cyclical shocks to the economy have dissipated. We decompose the observed real interest rate (r) into its equilibrium/trend (r*) and cyclical part[2] using an unobserved components model.[3]

Chart 2
r* and its determinants



Source: NBS.

The model is estimated on data for Slovakia's real GDP, real short-term interest rate (ex post), real effective exchange rate, and core inflation (quarterly data from 1994 to mid-2021). The estimation was made using Bayesian methods in which assumptions for key macroeconomic relationships[4] are combined with information contained in the Slovak data. A real interest rate (r) higher than r* dampens aggregate demand, since investment does not on average achieve the return that an economy in equilibrium provides. This brings the economy below potential, and the negative output gap will sooner or later have a downward impact on inflation pressures.

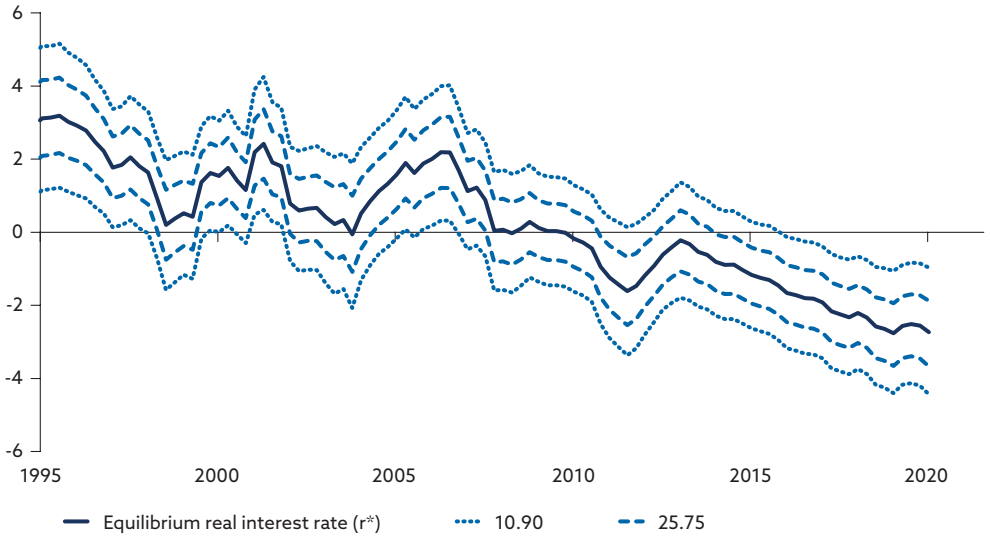
---

1 The methodology and estimation are described in more detail in Kupkovič (2020).
2 The estimation of r* typically uses the three-month real interbank rate, which approximates monetary policy decisions and from which other rates in the economy are derived (Walsh (2017)).
3 A state-space model of a small, open and converging economy, where the equilibrium variables are modelled using a random walk process and the cyclical components are modelled with an autoregressive process. For further details, see Kupkovič (2020).
4 For the cyclical components, the following key macroeconomic relationships hold: i) the open economy Phillips curve captures the impact of domestic demand factors (output gap), the real exchange rate and inflation expectations on core inflations; ii) the open economy IS curve describes the effects of real interest rates and the real exchange rate on the output gap; iii) the relationship between interest rates and exchange rates.

Equilibrium interest rates in Slovakia and the euro area have been in negative territory for more than a decade (Chart 1). This long-term trend is largely due to a changing savings-to-consumption ratio and a decline in labour productivity (Chart 2). If savings increase at the expense of consumption and there are insufficient investment opportunities for these savings, their value, and hence the price of money (the real interest rate), falls.

The increased incentive to save is due to an ageing population and to higher income and wealth inequalities, as well as to governments' post-crisis preference to cut spending in an effort to consolidate public finances. This is all putting downward pressure on the natural interest rate (r*). Moreover, the downtrend in r* has been accompanied by a significant decline in capital goods prices,[5] which, not being offset by a corresponding increase in investment, has translated into a further reduction in r*.

Chart 3
Confidence intervals for r*



Sources: NBS, and Kupkovič (2020).
Notes: (10.90) and (25.75) denote the lower 10% and upper 25% of the posterior distribution for r*. The grey shaded areas represent recessions in Slovakia and the euro area (OECD, Euro Area Business Cycle Network).

The estimation of r* as an unobserved variable is associated with uncertainty. The major part of this uncertainty comprises so-called filtering uncertainty, which arises from the particular formulation of an unobserved components model estimated with a Kalman filter. A smaller part of the uncertainty stems from the estimation of parameters that likewise can only be estimated. Given this uncertainty, the estimation of r* should be interpreted as an interval of potential values and with regard to the recent trend.[6]

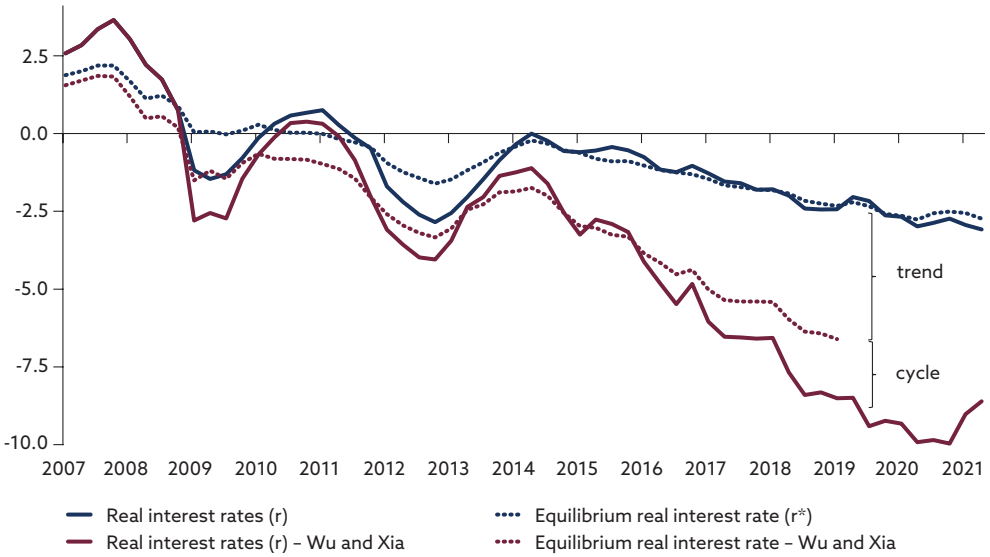
[5] Perhaps the best-known example is the price of computers, but a similar trend is seen, for example, in prices of motor vehicles and microprocessors.

[6] For further information on uncertainty in the estimation of r*, see the NBS Analytical Commentary Kupkovič (2022).

Even after absorbing the full range of uncertainty around the estimate, the natural interest rate lies deep in negative territory. In such case, the ability to achieve monetary policy goal rests on unconventional rather than standard policy instruments. Unconventional monetary policy takes a variety of forms, including quantitative easing, forward guidance on interest rates, and credit easing policies such as targeted longer-term refinancing operations (TLTROs).

The unconventional toolkit's aggregate impact on interest rates can be transformed into a single shadow interest rate,[7] i.e. a rate that reflects policy rate settings in a world in which they could slide further into negative territory. Unconventional monetary policy instruments can therefore help bring the policy rate below the natural interest rate, thereby supporting the incentive to invest and generally boosting economic growth.

Chart 4
Comparison of r* with the shadow interest rate



Sources: NBS, Macrobond, and Kupkovič (2020).
Notes: The real interest rate (blue solid line) and equilibrium interest rate (blue dashed line) are calculated similarly as in Chart A. The real interest rate based on Wu and Xia (2016) (red solid line) is adjusted for the impact of unconventional monetary policy derived from yield curve shapes. The equilibrium real interest rate based on the same approach (red dashed line) is the shadow rate after simulation.

The difference between the presented estimate of the natural interest rate and the shadow rate (Chart 4) therefore implies that the European Central Bank's unconventional monetary policy impulse has been reaching the

[7] The two approaches most commonly used to estimate the shadow rate are those described by Wu and Xia (2016) and Krippner (2013). Both are based on the transformation of a yield curve model, with Wu and Xia's approach using three determinants and Krippner's approach using two. For the sake of clarity, we use only Wu and Xia's approach. We previously presented it as a benchmark for the shadow rate in NBS's Frankfurt Papers series (No 8 of January 2022).

Slovak economy, especially since the end of 2014. The cyclical component of its impact (the difference between the equilibrium rate and current real shadow rate) is significantly smaller than the trend component (the difference between the equilibrium rates with and without unconventional monetary policy taken into account), and it has only been present since 2017. The entire impulse will gradually fade in coming months given the ECB's announced accelerated schedule for phasing out the asset purchase programme (APP).[8] It is also clear that the amount of excess liquidity will also decline over the medium term.

It is clear from their construction that both the natural interest rate and shadow rates will move back towards positive territory. Although demographic trends are stable, current and future migration waves together with higher supply-side inflation that favours borrowers over savers will affect the marginal propensities to save and consume.

The constraints on labour productivity (not captured by the *incentive to save and invest* component in Chart 2) and economic growth resulting from market uncertainty and uneven developments in the supply of goods and services are unlikely to allow a return to potential output and to the natural interest rate levels observed in the positive rate environment that existed prior to the 2008 financial crisis; nevertheless, a partial return and the stabilisation of rates at moderately positive levels can be expected.

It is therefore not enough for us to know where Columbo's wife (the natural interest rate) is and what she looks like. Given the rate's great power over the fate of the economy, we would also need to know where it is headed. This knowledge will help us conduct monetary policy, address financial stability issues and better understand the role of fiscal policy in stabilising the business cycle.

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[8] The acceleration of the APP's phasing-out was announced at the press conference following the meeting of the ECB's Governing Council on 10 March 2022.