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László Békési–Zsolt Kovalszky–Tímea Várnai

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The views expressed are those of the authors and do not necessarily reflect the official view of the central bank of Hungary (Magyar Nemzeti Bank).

MNB Occasional Papers 125

Scenarios for potential macroeconomic impact of Brexit on Hungary**

(Forgatókönyvek a Brexit lehetséges magyar makrogazdasági hatásaira)

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Abstract

The purpose of this paper is to illustrate the economic impact mechanism of the secession of Great Britain from the European Union (Brexit) on the Hungarian economy, and to quantify the domestic growth risks. Several international studies have dealt with this topic using partial analysis and model based simulations, but only partial analyses are available regarding the Hungarian economy. Our analysis provides a broader picture by using the new macroeconomic forecast model of the MNB. Upon determining the exogenous assumptions in our simulations we relied on the central bank experts' broad knowledge. The applied model handles the wealth heterogeneity in the decision making processes of the households and the corporate sector. This feature makes the model suitable for explaining prolonged after-crisis recovery and the role of the financial accelerator feedback mechanism.

In the course of illustrating the economic impact mechanism we show the main channels through which Brexit can spread over to Hungarian economic growth. Besides the primary channels, our analysis includes the secondary channel effects increasingly in the spotlight: we investigate the shock resilience ability of the financial system, and analyze the potential room for manoeuvre for fiscal policy.

JEL codes: E27, E66

Keywords: Macroeconomic modelling, Simulation, Alternative Scenarios, Brexit, Economic Outlook

1. Introduction

The purpose of this paper is to illustrate the economic impact mechanism through which the exit of Great Britain from the European Union (briefly: Brexit) may spread over to the Hungarian economy, and to quantify the expected effects in various scenarios with the new macroeconomic forecasting model of the MNB. Although the direct trade exposure of Hungary with the UK is low, our largest trade market (the continental part of the European Union) has a significant legal, political and economic connection with the United Kingdom. As a small open economy, Hungary depends on the economic performance of its foreign trade partners to a great extent, thus, in terms of the outlooks of this country it is a relevant question through what channels, in what time frame and to what extent the international effect of Brexit spreads over to the Hungarian economy.

Public opinion has dealt with the topic of the exit of the UK from the European Union for a long time. The antipathy for the European Union has increased in the course of the EU enlargements, and the UK has been reluctant to both monetary and fiscal union for a long time. However, the possibility of leaving became a reality with the calling (and result) of the referendum. After the calling of the referendum, several analyses have attempted to quantify the effect of the exit on the United Kingdom. As formulated by Baker et al (2016b), Brexit is a large scale socio-economic event, in the course of which the British and European economies will be transformed structurally. The change will affect several parts of the economy and after the decision to exit, the development of two main lines is possible: if the parties succeed, in the course of the negotiations, in establishing an economic and legal status similar to the former (i.e. Brexit is formal), the previous economic system will remain, otherwise Great Britain (and the European Union) will enter a new economic system. In the course of such an event, if the connections operating previously change depending on the new legal and economic conditions, that represents a serious modelling challenge for quantifying the effects. We note here that some impacts cannot be calculated in this analysis because of constraints of modelling (e.g. European social and political consequences of Brexit), which, however, would influence the presented results substantially.

The analysis is made more complex by the chronological schedule of the problem as well. The referendum was an event occurring on a date known beforehand by the economic participants and the money markets. Thus, the possibility of the regime change could partly be incorporated to the expectations and it did not come as a complete surprise for the economy. Because of this it is difficult to identify the size of the shocks from the information that can be obtained from the data. The role of expectations is important in the process of the negotiations, too. Before the finalisation of the new trade and legal regulation, the economic participants can build in the outcome of the negotiations to their expectations, therefore, the adaptation could have started already earlier as well.

Several international analyses have been published in this subject, in these we can have detailed information about the effect of Brexit on Great Britain and the European Union, about the time horizon of that and the assumptions applied in the course of the research. During the preparation of this study, we naturally depended considerably on this literature, however, upon quantifying the effects on the Hungarian economy, this can be considered as the first model-based analysis. After the crisis that started in 2008, the shortcomings of the widely used central bank models were awaiting for solution. The possible answers were already partly available in the economic literature, thus, in the new monetary policy model developed in the MNB we took into account the role of wealth in the decisions of households and

companies, and the financial accelerator effect. Thereby the model provides assistance in understanding slower recovery after a great decline. Moreover, when calibrating the assumptions, we could also depend on the MNB's expert knowledge with wide ranging information.

Because of the critical role of uncertainty, we subject our results to sensitivity analysis, according to the general practice: starting from the assumptions used during the simulation, we present the possible risks, and alternative results related to them as well. We present the sensitivity analysis in more details than usual: we specify three possible scenarios. The size and timing of the shocks evolve differently in the scenarios. During the analysis we distinguish between primary and secondary channel effects. The primary, direct connection explores mechanisms such as the effect on economic growth of changes in external demand, terms of trade, risk premiums, remittances, EU transfers and FDI. Upon examining the secondary channel effects, we concentrate on two areas: the shock resilience of the financial intermediary system and the room for manoeuvre for economic policy. We could experience the relevance of this in the period after the crisis as well, the tensions inherent in the financial system can strengthen the macroeconomic shocks, whereas the role of economic policy may be an efficient tool in alleviating the cycles.

In our results we have made the following main findings. Brexit can only have a limited effect on the growth outlooks of the Hungarian economy. The most significant channel through which Hungary can be involved is the decline of external demand. However, because of the small extent of the direct trade connection of Hungary and the United Kingdom, this can be considerable only if the fall in British economic growth spreads over to the European Union. As a result of the adaptation taking place in the Hungarian financial system and the active economic policy (changes in regulations, early repayment, conversion of foreign currency loans into forint), the stability in the sector has improved significantly, thus, the Hungarian financial system is capable of taking the edge of effects arriving from outside. The low deficit and decreasing debt path, emerging as a result of fiscal consolidation, create room for manoeuvre for active stimulation of demand.

The study is continued as follows. In the second chapter we provide an outlook about the literature related to Brexit. In the third chapter we summarise the international effects of Brexit. In the fourth chapter of our analysis we explore the impact mechanism of Brexit. In the fifth chapter we present three types of possible scenarios and we determine the size and timing of the shocks belonging to these. In the sixth chapter we present the model applied and the results, assuming exogenous fiscal policy. Finally, in the seventh chapter we mention what the room for manoeuvre for an active fiscal policy, intending to offset the effect of Brexit, is complying with the Maastricht criteria.

2. Literature review

Several international studies have been prepared about the impact analysis of Brexit. Of the studies prepared about the United Kingdom, we find both detailed partial analyses¹ and analyses related to the impact examination of the exit on the entire British economy. The descriptive study of Begg (2016) is among the partial analyses, in this he analysed what the distribution of the incomes of the EU budget is. He stresses that net payment should be taken into account when evaluating the costs of membership. Depending on the new status of the UK, we also calculate on the decrease (or incidental fall out) of this in the course of evaluating the effect of Brexit on EU funds.

Portes (2016a, 2016b) calls the attention to the migration and labour market consequences of Brexit, which is relevant in terms of Hungary as well, since the number of Hungarians finding work in Great Britain has increased gradually since 2004 and the income transferred home from the UK increased fourfold after 2012 (see Labour Market Yearbooks²). Portes stresses that the inflow of Eastern European labour force has been favourable for Great Britain, too: after the EU enlargements, migration has not damaged the employment chances of the local population and it may have decreased wages only slightly in the case of jobs requiring lower qualification, and its effect on the budget has been positive as well. Although the result of the referendum clearly requires a change in the migration policy from the leadership of the country, according to Portes it is not likely that free access to the Single Market can occur with a significant restriction on the free movement of labour.

Head and Mayer (2015) and Dhingra et al (2016) examined the production processes, new investments and foreign direct investment concentrating on car industry. The analyses set out from the positive economic impact of the accession to the European Union and the Single Market. Namely, the trade and co-ordination costs play an important role in the decisions of multinational enterprises on selecting plant location. The Single Market ensures that these costs remain low among the member states as well, with the common legal and economic regulation and the free flow of goods. It is extremely important for multinational companies what kind of legal and economic agreement is made in the series of negotiations after Brexit, especially in their decisions of future car industry investments. The decrease in harmonisation of legal regulations and the re-establishment of customs duty may affect the economy of the UK negatively, while Hungary may benefit from the FDI financing car industry investments flowing to the continent.

Concentrating on the short-term effect of Brexit, Baker et al (2016a) present that the real economic role of the increase in uncertainty and risk is significant in the short term. On the one hand, the uncertainty and the tightening conditions of lending decrease internal demand. On the other hand, in the case of an unfavourable (WTO-type) agreement, the British pound may suffer a considerable (over 15%) depreciation in the short term, as an effect of the significant increase in risks. This contributes to the increase in exports via the improving competitiveness of the United Kingdom, which may offset in 2016

¹ The May 2016 issue of the National Institute Economic Review dealt prominently with the situation of Great Britain and the possible effects of Brexit.

² In Labour Market Yearbooks 2015, a few analyses were published about migration, and including especially remittances (e.g. Kajdi 2016 and Christian 2016).

the internal demand falling as a result of debt downsizing. The trends in risk premiums are relevant in terms of Hungary as well, since the flexible exchange rate makes it possible that the improvement of competitiveness can diminish the fall in demand.

Collecting the partial effects of Brexit on the UK, Thompson and Harari (2013) prepared a detailed analysis. However, methodological studies were also prepared about the comprehensive effect of Brexit: Pain and Young (2004) and Baker et al (2016b) examined it using a macroeconomic model. In their methodological analyses, they considered the previous effects (or channels) and they build these into a model frame containing endogenous fiscal and monetary policy (to the NiDEM and its successor NiGEM model). Baker et al (2016b) present the effect of the channels separately as well and prepare sensitivity analysis, too. We determine the size and timing (permanence) of the shocks affecting the Hungarian economy, in part similarly to the study of Baker et al (2016b). We calibrated the shocks with historical data analysis and impulse response fitting.

The large international institutions also prepared comprehensive analyses for the United Kingdom and the European Union. In its country report, the IMF deals with the British exit and the international effects of that (IMF, 2016a). The study of Kierzenkowski et al (2016) was prepared within the OECD and it quantifies the long-term effects on sustainable growth as well. They name the channels and stress the time frame of the effects of those, and they present separately the effects occurring until 2020 and on long term (until 2030), too. Our study also takes it into account that Brexit has its effect on the economies of Great Britain, the European Union and Hungary via several channels. Similarly to the study of Kierzenkowski et al (2016), we also name the direct channels, however, we emphasise the role of indirect channels (such as the shock resilience of the financial system and the economic policy) as well, presented by Balatoni and Virág (2016), in diminishing the indirect effect of Brexit.

3. Brexit

At the referendum on 22 June 2016, British voters voted with simple majority to leave the European Union. Article 50 of the Treaty of Lisbon of the EU³ is the authoritative legal document in connection with Brexit, according to this 2 years of series of negotiations would await for the United Kingdom and the EU, which can be prolonged with the agreement of the European Commission in order to develop the status of the country after Brexit. Based on the British declarations, the clause will not be activated until the end of 2016.⁴

In the course of the negotiations, Great Britain and the member states of the EU have to agree on the following points:

1. A new institutional environment has to be developed, in which it is stipulated how the United Kingdom integrates to the legislative system of the EU, how the settlement of disputed legal cases will take place, and what regulation will be valid for British legal entities.
2. The parties have to agree what role Great Britain will undertake in the EU budget. This may affect the Structural and Cohesion Fund and the distribution of funds spent on research.
3. The new system of rules related to the movement of labour and the conditions under which Great Britain can have access to the Single Market have to be determined. The two criteria are closely related to each other, the system of rules pertaining to goods, services and capital flowing in the internal market of the EU cannot be separated from the movement of labour.
4. If the Single Market becomes accessible to Great Britain in some form, it will have to be regulated how goods and services stemming from third parties can be sold via the UK and with what restrictions. If this is not implemented, practically anyone could have a piece of the internal market of the EU via the United Kingdom.

3.1. INTERNATIONAL EFFECT OF BREXIT (UNITED KINGDOM AND EUROPEAN UNION)

The secession negotiations will result in a lengthy legal process, where several parties will attempt to enforce their interests, and it will remain in question how consistently the EU member states will act on this subject. The longer term outlooks are shaded by the fact that neither the pro-exit nor other British leaders have outlined their ideas and viewpoints in connection with the period after Brexit. Because of this, the status of the post-Brexit United Kingdom is surrounded with many uncertainties. At the same time, the outcome of the negotiations will be critical for the future of the European economy, therefore several international analyses have attempted to quantify the real economy effect on Great Britain, the European Union and the Central and Eastern European region (Citibank 2016, Consensus Economics, IMF 2016a and 2016b, Kierzenkowski et al 2016, Morgan Stanley 2016).

According to the estimates of the major international institutions (IMF, OECD), the secession of the United Kingdom from the European Union can cause a significant, negative shock to the British economy,

³ <http://www.lisbon-treaty.org/wcm/the-lisbon-treaty/treaty-on-european-union-and-comments/title-6-final-provisions/137-article-50.html>

⁴ Available information until the end of September 2016 are considered.

and it is expected that the spillover effects are likely to slow down the economy of the EU in the following quarters. As a result of the decision, the reactions of the market and the change in the system of conditions of regulation and trade can have a negative effect on economic performance via several channels, such as the general increase in risk premium, waver in business confidence, decrease in the intensity of foreign trade relations, slow down of capital flow and the change of its direction.

According to the result of the analyses, the uncertainty of the outcome of the negotiations sets back internal demand as well, inasmuch as companies postpone or decrease their investments, whereas households postpone or decrease the purchase of durable goods. Moreover, in the medium term direct investment may flow from the UK, and production capacities may move to the continent, which slows down the growth of the British economy in the medium and long term, whereas it stimulates increase in trends in the EU. According to another often mentioned effect, as a result of the significant change in regulation, London could not retain its role as a global financial centre. The Swiss stock exchange was first to contact the German financial supervision to negotiate about the relocation of their headquarters (*Financial Times* 2016). Their motivation was primarily the assumed decrease in the role of the London-based Financial Conduct Authority (FCA) within Europe. We find signs pointing to this in the non-financial sector as well, in the survey of the 500 largest American enterprises (*Fortune* 2016), large companies generally talk cautiously about Brexit (keeping the interests of the customers and shareholders of the companies in view), but they emphasise the importance of adaptation to the new situation. Both American bank CEOs (*The Telegraph* 2016) and Japanese leaders (*BBC* 2016) recently warned London that companies may relocate their headquarters elsewhere. Similar decisions may be made by car industry company groups, held by German concerns, depending on the change in regulation (*SMMT* 2016).

The OECD calculates (Kierzenkowski et al, 2016) that in the case of Brexit – i.e. if the British EU membership is terminated – the British GDP would be almost 1.5 per cent behind in the short term (2016-2018) and in 2020 it would be more than 3 per cent behind the level which could be achieved by the British economy in the respective year as a member of the European Union. According to the estimates, losses may increase even further in the long term (by 2030), i.e. compared to the basic path calculating with unchanged British EU membership, the level of GDP may be more than 5 per cent lower in the long term.⁵

Based on the short-term effects presented in the studies of the IMF (2016a and 2016b) and the OECD (Kierzenkowski et al 2016), as a consequence of Brexit, economic growth of the eurozone and the European Union could slow down by 0.2-0.3 per cent in 2016, whereas in 2017 the growth of GDP could be 0.6-1.1 percentage points lower.

So far no slow down is visible in the data, however, Markit PMI, indicating business mood and expectations related to the British economy, indicates significant deterioration of mood in both industry and the service sector after June. Of the confidence indices related to the eurozone, only the more sensitive German ZEW business index shows a substantive decline for the period after June, whereas IFO and EABCI only shows a mild decrease.

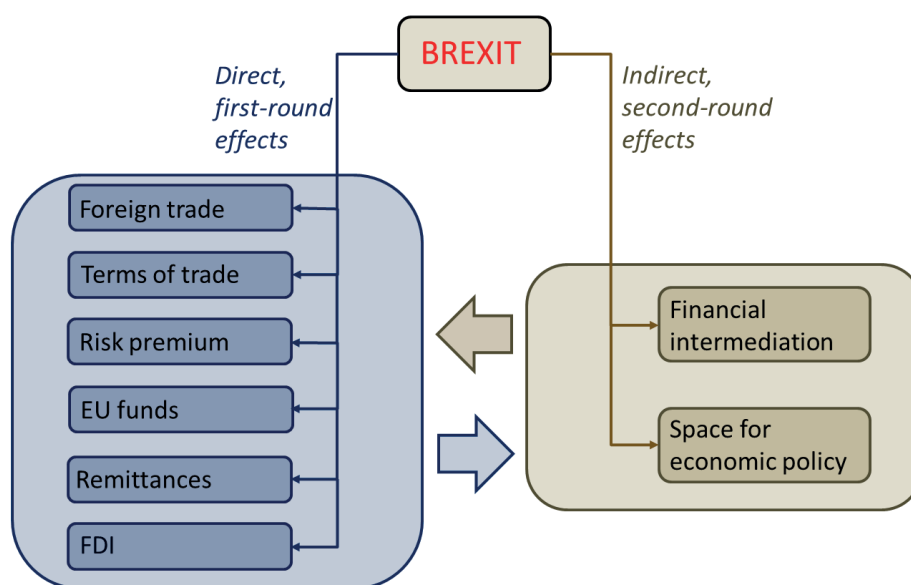
⁵ The OECD calculates on three kinds of scenarios in the long term in the case of the different development of the trade agreement, investments and migration. The effect on the level of economic output may be -2.7% in the favourable case and -7.7% in the unfavourable case.

4. The impact mechanism of Brexit

In what follows we first summarise the channels through which Brexit has an effect on the Hungarian economy. Among the effects we can observe both direct and indirect effects (Chart 1). As a direct effect, foreign trade may slow down (decline), the amount of funds from the EU and the remittances can decrease, and in parallel with this, with the increase in uncertainty, the risk premium can increase in some countries. Commodity prices decreasing as an effect of subdued demand on the world market, cause an improvement of terms of trade. The flow of FDI to the continent can start in the medium term. As a secondary channel effect and as a result of the positive feedback, a stronger reaction can evolve in an extreme case in the EU and emerging countries with a vulnerable financial system. It is also important that Brexit can trigger an economic policy reaction as well, in the framework of this the decision makers can decrease the potential negative effects with the tool of active demand management. The extent of this reaction greatly depends on the size of the room for manoeuvre of individual countries and governments in the budget, taking into account the EU regulation.

In this chapter we present in detail the six primary channels, and also the time frame and direction of the effect of these on growth, inflation and external financing capacity. Moreover, we emphasise the role of secondary channels in the development of secondary channel effects.

Chart 1: The impact mechanism of Brexit



Source: MNB

4.1. DIRECT, PRIMARY CHANNELS

4.1.1. External demand

In and of itself the direct trade connection of Hungary to the United Kingdom cannot be considered as significant, the ratio of Great Britain within the Hungarian exports of goods and services does not reach 5 per cent. However, the Hungarian economy has a close trade connection with the other member states of

the European Union, 75.2 per cent of Hungarian exports are transported to the other regions of the EU. The uncertainty emerging as a result of the British referendum and the structural adjustment of the economy may set back the growth of the European Union and the external demand of the Hungarian economy in the short and medium term.

In terms of Hungary, the growth effect of Brexit influencing the European Union is dominant, since an order of magnitude greater part of Hungary's exports are directed towards this region. In making an assumption on import based external demand, we corrected the changes in GDP-based external demand with the import/GDP elasticity calculated on the basis of historic data. The impact of the slowdown of our external demand on the growth may be significant, as exports represent a high ratio – 92 per cent – within domestic GDP. However, this effect may be mitigated by the fact that the import content of exports is significant – 65 per cent – in Hungary (Table 1). In parallel with the decrease in external demand, it is expected that foreign central banks intend to offset the effect of declining demand on growth and inflation, thus, in the course of the model simulation, we assumed decreasing external interest rate.

Table 1: Our assumption related to external demand

Hungary's exports of goods and services (2014)	
United Kingdom	4.8%
EU (without UK)	75.2%
Export/GDP ratio (2015)	92.1%
Import content of exports (SUT, 2008)	65.0%
Import/GDP elasticity (Great Britain)	1.8
Import/GDP elasticity (EU)	2.7

Source: HCSO, UNCTAD database

Different kinds of agreements can be concluded in the course of the secession negotiations, hence we subjected our assumptions related to external demand to sensitivity analysis during the model simulations, and we examined several possible alternative external demand paths. We made our assumptions (Table 2) based on the Brexit study of the OECD. Kierzenkowski et al (2016) outlines three scenarios for growth in Great Britain, the paths of which coincide until 2020 and are separated thereafter (until 2030). However, we assume that depending on the evolution in the exit negotiations, the three scenarios may be different already in the short and medium term (until 2020), and much of the long-run real economic impact calculated in the OECD study may take place by 2020. Our assumption on the growth trajectory of the European Union was calculated as follows: the Scenario I used the growth numbers in the OECD study (impact in 2020), while the other two paths were determined based on the EU's trade exposure and the co-movement of GDPs.

**Table 2: Assumptions related to the change in growth rate of Great Britain and the continental EU
(deviation from the baseline, percentage point)**

	Great Britain			EU (excl. Great Britain)		
	I.	II.	III.	I.	II.	III.
2016	-0.2	-0.5	-1.5	-0.3	-0.4	-1.0
2017	-1.1	-1.7	-2.9	-0.7	-1.1	-2.2
2018	-1.1	-1.5	-2.3	-0.3	-0.5	-1.3
2019	-0.4	-0.7	-1.4	0.1	0.1	0.0
2020	0.1	0.1	0.0	0.4	0.6	0.5
Average	-0.5	-0.9	-1.6	-0.2	-0.3	-0.8
<i>Aggregate impact on the level of GDP</i>						
2020	-2.5	-4.5	-8.0	-0.9	-1.4	-4.0

Source: OECD, MNB

If the negotiations are successful and the parties succeed in retaining in force trade legal regulations similar to the current ones, only the temporary uncertainty will decrease growth in the UK. The effect of this can already be felt currently, several financial and non-financial companies indicated that they would relocate a part of their operation to the continent. However, growth can be reduced significantly if the negotiating parties fail to agree. In the case of a more considerable decline in external demand, the foreign interest rate descends to a lower level in our assumption.⁶

4.1.2. Terms of trade

During the analysis we had a separate assumption for the change in terms of trade, which is strongly related to the decline of our external demand. In the course of the modelling practice currently used at the MNB, we had an exogenous assumption for the external variables. When calculating the model simulations, we provided an expert assumption for the prices of imported inputs in production, such as the price of oil and general imported products. Namely, in parallel with the slowdown of external demand, the demand of developed economies for raw materials (e.g. oil) decreases, which improves our terms of trade through the decrease in raw material prices. On the one hand, as a result of the improved terms of trade our balance of payments will improve nominally, on the other hand, our net exports will be adjusted to the relative price change in volume as well, mitigating the growth-weakening impact of the foreign trade channel. Moreover, the decreasing raw material prices reduce inflation, too.

To make assumption on oil prices, we examined the relationship between oil prices and world demand using simple linear regressions. Using the regression result, we determined the scenario paths of oil prices in the short-term (till the end of 2017). In the mid-term we assumed that oil market supply will adjust to the decrease in demand, which we incorporated as a gradual decay of the deviation of oil prices from the baseline path.⁷

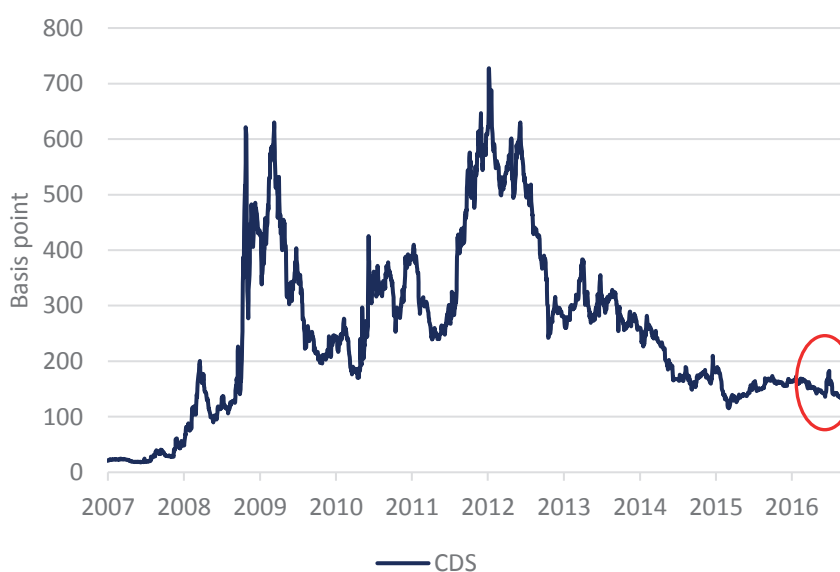
⁶ The extent of the latter change was calibrated with the help of the movement of the market yield curve. For Scenario I, we assume the interest rate path to remain unchanged (central banks in developed countries operate with coordinating communication and providing liquidity). For Scenario II and III, we displayed the movement in yield curve observed during the month following the Brexit referendum, and the double of it.

⁷ We incorporated the change in oil prices into foreign inflation as well, based on partial update elasticities of the ECB for the eurozone.

4.1.3. Uncertainty

The risk premium and its changes provide important information for money market participants, with this they can rank the given economies and how much uncertainty they should associate to their investments. The value of the indicator is fundamentally influenced by factors such as indebtedness (and within this, critical are external debt and the share of debt denominated in foreign currency), growth outlooks and financing imbalances. Following the economic crisis in 2008, risk premium increased significantly in a number of countries, and received great attention among a wide range of investors. Hungary was no exception, either, and the strong reliance on external funds – high foreign currency debts both of households and the Hungarian state – and the partly related structural growth problems resulted in our significantly worse risk rating. At the end of 2008 the Hungarian five-year CDS spread increased by more than 300 basis points (Chart 2). The excessive deficit procedure, dragging since 2004, contributed to this as well. With the stabilisation of the external and internal balance and with the significant decrease in vulnerability, the fiscal measures and the monetary policy reform resulted in a change in the judgment of the country. In 2013 Hungary emerged from the excessive deficit procedure. The favourable development of the processes further strengthened each other through the positive feedback mechanism. This has also been confirmed by the upgrade of Hungary by Standard and Poor's to investment category. In a dynamic global economic situation, investors can better diversify their portfolios, however, the slowdown of growth and the turbulent environment occurring as a result of the British referendum again placed the risk map of the world and the role of safe havens to the front.

Chart 2: Developments in the Hungarian 5-year CDS spread



Source: Bloomberg

Therefore, it is important to review how international events affected the assessment of country risk since the stabilisation of external and internal balance. In May 2013 after the announcement of the Fed tapering, the Hungarian CDS spread rose by about 100 basis points. In December 2014, it rose temporarily by barely 50 basis points as an effect of the impact of mini Russian ruble crisis. As a result of Brexit its immediate increase was 50 basis points.⁸ The temporary shocks quickly corrected: the CDS spread has

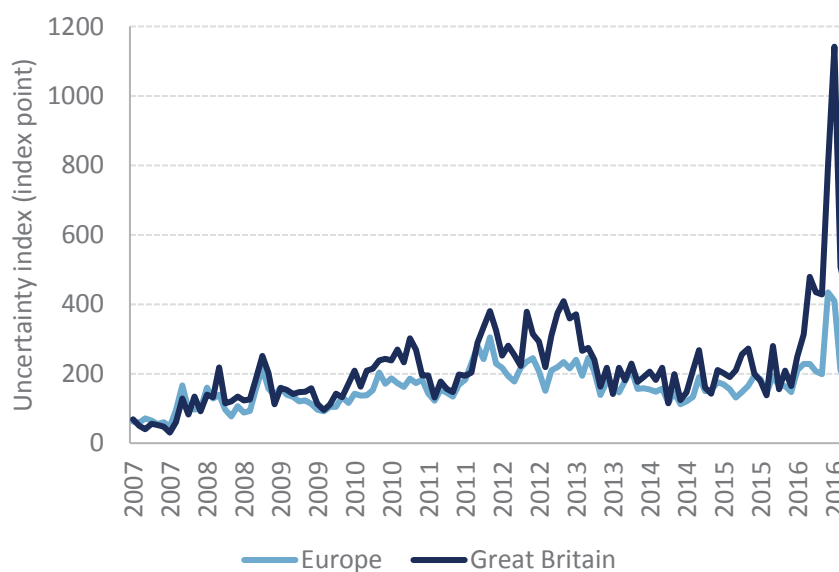
⁸ After the referendum, money market volatility has increased generally and the CDS spread of several countries has increased significantly.

decreased to the level before the referendum, and the forint has since then strengthened compared to the euro. We find that the impact of international events is much more subdued compared to those observed during the crisis.

Financing capacity decreases slightly as an effect of uncertainty. The increase in financing costs decreases the balance of goods and services via the reduction of production and exports, which is partly mitigated by the export stimulating effect of the improvement of competitiveness due to the depreciation of exchange rate. This is offset by the smaller deficit of the income balance, since a lower external interest environment and slower increasing profit rate characterise the situation of the companies. The interest paid on external debt is smaller because of the lower interest environment, moreover, the profit produced by foreign companies in Hungary (and by Hungarian companies abroad) is also lower, which reduces the deficit of the income balance. The weaker exchange rate and the increase in financing costs are built in the prices, which raises inflation in the short and medium term.

Political uncertainty in the European Union, which raised as an effect of the Brexit referendum, has returned to the value observed in the period before the British referendum (Chart 3). For now the data indicate that the increased uncertainty remains localised to the United Kingdom. However, we cannot rule out the likelihood that further developments occurring in the course of the negotiations can again cause an increase in uncertainty in the European Union and Hungary. Thus, during the presentation of the impact of the risk premium we relied on alternative scenarios as well, we thereby illustrate what changes result from the various extents of money market turbulence developed after Brexit. If the effect of Brexit continues to be localised only to the United Kingdom, our assumption related to the risk premium will remain unchanged. The increase of risk premium remains subdued even in the other scenarios: we assume the immediate reaction following the Brexit referendum (50 basis points), and its double, which corresponds to the increase experienced after the Fed tapering (100 basis points). The following events are expected to increase the extent of risk premium: an incidental referendum arises in other countries, too; the negotiations result in insurmountable differences in the ideas of some member states; contamination emerges among the countries via the vulnerable banking sector.

Chart 3: Developments in the political uncertainty index



Source: www.PolicyUncertainty.com (Baker, Bloom and Davis (2015): *Measuring Economic Policy Uncertainty*)

4.1.4. EU funds

The net contribution of the United Kingdom to the budget of the European Union is considerable, thus, the question arises after the secession: how much will the amount of EU funds decrease as a result of the eliminated payment of the UK? In the case of the CEE countries, development funds of significant amount arrive to the region, and several industries depend on these supports. In Hungary, a considerable part of the output of the construction industry is financed from this, and the extent and schedule of the funds arriving from the EU budget have an important role in the growth of state and private sector investments as well. The decrease in EU funds or the suspension of their disbursement may temporarily restrain the performance of the Hungarian economy, just as it was shown by the data of the beginning of 2016, too.

The budget of the European Union is determined by a complex legal regulation, and the secession of the UK is currently considered as an unexampled event in the history of the EU. It is expected that the new agreement will take a long process and the position of the EU member states may also differ in the course of the negotiations. During the model simulations we assumed that the United Kingdom will activate the secession clause still this year and the status quo may remain until the conclusion of the negotiations, i.e. the British will presumably continue to pay their net contribution of 6 per cent to the EU budget until October 2018 (Table 3). In the medium term their payment will decrease, depending on the outcome of the secession negotiations. We assume that the EU budget will not be curtailed with across-the-board cuts, but basically the structural and cohesion funds will be reduced, while the single area payment schemes (e.g. agricultural subsidies) that make up half of the EU budget will be left intact. It is likely that the protection of this is in the interest of the larger countries too, thus its value and base are firmer.

We calculated the fall in the funds received by Hungary using the forecast figures of the 2014-2020 EU budget and the ratios of payments and withdrawals of the previous budget cycle (Table 3). The fall in the funds will restrain state and private sector investment as well, since the government is committed to spending 60 per cent of the funds for economic development.

The financing capacity of Hungary is reduced by the decrease in EU funds via the decline of the balance of capital account. According to our assumption, Brexit will not affect the ongoing transfers significantly, since mainly single area payment schemes are here (e.g. agriculture). The subsidies paid by the funds appear in the capital transfers, thus, in the medium term, after the conclusion of the negotiations, the decrease in EU transfers will reduce the balance of capital account.⁹

Table 3: Great Britain's contribution to the 2007-2013 budget of the European Union

EU budget (billion EUR)	114.6
Great Britain's payment (billion EUR)	13.6
Great Britain' withdrawal (billion EUR)	6.7
Great Britain' net contribution (billion EUR)	6.9
<i>In the ratio of the EU budget</i>	6.0%

Source: EUROSTAT

The EU funds and the new common budget will depend on the secession negotiations, we illustrated the uncertainty surrounding the agreement with several alternative scenarios here as well. If the United

⁹ See Kóczian's (2016) study in detail.

Kingdom succeeds in retaining a status similar to the current one and the exit can be considered only as formal, then the negotiating parties may accept that they signed the seven-year budget about the amounts of payments and planned withdrawals until the end of the current budget cycle. In this case, the British payments will remain unchanged even until 2020, the end of the seven-year cycle. The volume of the EU budget will not change and the method of distribution of the funds will also remain similar to the former situation. The referendum will have no effect on the EU budget and on the growth of the Hungarian economy. If the type of the contract with the island nations was similar to that with Switzerland, then Great Britain continues to pay into the common EU budget – i.e. based on bilateral agreements contribute to EU programmes and to reduce economic and social disparities in Europe – but will not receive payments. Thompson and Harari (2013) quantified the per capita UK (128 pounds in 2011) and the Swiss net payments (53 pounds on yearly average of 2008-12), based on which the British contribution to the budget would decrease by nearly two-thirds (to its 41 per cent). However, such an extreme agreement may emerge in the course of the negotiations which terminates the current practice completely and the net payment of Great Britain will be eliminated from the EU budget entirely, and the missing part will not be supplemented by the member states. According to our assumption, in the latter case the funds received by Hungary will decrease by almost 12 per cent from the end of 2018.

4.1.5. Remittances

In recent years the number of Hungarian employees working in the Western European countries, and especially in Great Britain, has increased considerably. Some of the wage income they earn increases the demand in the Hungarian economy, as family members at home also get an income from the transfers. According to Meyer and Shera (2016), there is a significant and positive relation between remittances and economic growth. According to the balance of payment statistics, the total amount of home transfers by people working in Great Britain is less than half a billion euro. Hungarian non-residents working in the UK actually transferred EUR 0.17 billion to their home countries as remittances in 2015, and the income of Hungarian residents was EUR 0.2 billion (but this includes the costs of living there, too, and the actual transfer may be a fraction of that). The value of remittances expressed in HUF – and, thus, their impact on domestic demand – is determined in the short term mostly by the extent and the permanence of the weakening of the pound, and additionally in the medium term, the new regulations regarding the movement of labour as defined in the negotiations. Based on the opinion of experts, the result of the referendum unambiguously requires the change of the migration policy from the leadership of the country, however, the EU may set free flow of labour as a condition of retaining the closer economic relations (Dhingra and Sampson 2016, Portes 2016a and 2016b).

Similarly to the other channels, in the analysis of incomes transferred home, we examined alternative cases. The amount of remittances is primarily affected by factors such as the new labour market regulation and the extent of devaluation of the British pound (that can reach 10-20 per cent permanently). The impact would be weakened if the Hungarian employees working in the UK and already with experience abroad could successfully find a job in another EU member state after a brief temporary period.

Regarding the labour market regulations, it is crucial to mention the possible outcomes of the British migration policy. Portes (2016a and 2016b) describes the possibilities of the new migration policy, and indicates that current migration policy of Switzerland and Norway is not an option because they allow for higher levels of migration from the EU than that in Britain. Moreover, if the number of migrants coming

from the EU was substantially diminished, it would have serious economic consequences in practice in the long run on public finances and output. In addition, at a sectoral level, recruitment of low-skilled local workers would face considerable problems in the short term. Despite the difficult feasibility and economic consequences, since the opinion of population about the migration policy had a defining role in the referendum results, we calculate that the number of Hungarian UK-workers can fall to the level before the EU accession in 2004.

In the sensitivity analysis, three paths for the GBPEUR exchange rate are assumed. In the first alternative scenario, it is assumed that 10% exchange rate depreciation that occurred during two months following the British referendum will remain until 2020. In Scenario III, we approached exchange rate path displayed in Baker et al. (2016): exchange rate of the British currency depreciates 16 per cent on average of 2019-2021, in the long term. We let the short term path of exchange rate converge to that level in the long term. The path in Scenario II were calculated between the two (13 per cent).

4.1.6. Reallocation of FDI to the Great Britain

Foreign direct investment is of fundamental importance in the long-term growth of the Hungarian economy. Multinational companies take several considerations into account in their investment decisions, such as the qualification of the workforce, state of development of the infrastructure, costs of production (wages, taxation), macroeconomic stability and uncertainty of economic policy. Hungarian economic policy has improved the capital attracting capability of the economy in several important areas, burdens on labour force have decreased, the external and internal balance has improved, and the budget deficit has decreased.

The British referendum has resulted in a lot of unanswered questions and the uncertain environment is not favourable for the assessment of the UK by investors. Thus, if the relocation of production capacities is implemented, the Central and Eastern European region can be a target of that. Capital may move here primarily on the basis of low production costs, stable macroeconomic environment, and the activity of multinational companies performed in this region until now, and thus the capacities of the Hungarian economy may also increase.

It is expected that the structural economic rearrangement will have a positive effect on the inflow of FDI to Hungary, however, the extent of this is influenced by several factors. The British car industry employs 800,000 workers and it produces value added of GBP 15.5 billion per year, which is significant. Based on the January-February SMMT (2016) survey, 77% of the respondents felt it before the vote that further membership would represent the best alternative in the future and the incidental secession would have a bad effect on the business environment. This is supported by the car industry analyses of Head and Mayer (2015) and Dhingra et al (2016), according to whom the exit from the EU may cause an increase in (trade and co-ordination) costs and, thus, a decline in production. On the basis of these, Brexit may unambiguously contribute to the partial reduction of capacities, and if the assessment of Hungary remains favourable in the region, we can also calculate on further investments. It also has to be mentioned by all means that many changes have occurred in the car industry in recent years. Asian manufacturers represent an increasing part of global production, the popularity of brands is changing and electronic cars become popular, too. Production also has to adjust to this gradually, and even if there is no significant reduction in British production in the period after the referendum, it is likely that they can gain the new investments of the future with smaller chance than the regional countries. This is built modestly into our simulations in the following way. In case of the reallocation of the British FDI, we calculate with an inflow

of FDI to Hungary for the period of 2019-2020, that is comparable to FDI inflows related to automotive investments experienced in previous years (200 billion HUF over two years).¹⁰

4.2. SECONDARY CHANNELS

It is an important experience of the 2008/2009 crisis that not only the primary, i.e. direct, channels are important for quantifying the impact of a shock or impulse, but the feedback mechanism appearing in the financial system and the room for manoeuvre of economic policy have to be taken into account as well. Based on the experiences, these latter can significantly strengthen or, actually, mitigate the negative economic reactions (see Balatoni and Virág 2016, and Váradi et al 2016). During the crisis, the economies that had greater room for manoeuvre of economic policy and/or financial intermediary system operating stably did not decline to a great extent and had faster growth in the period of recovery as well (e.g. Poland). In contrast, in Hungary the shock resilience of the financial system was weak because of the strong dependence on external funds, moreover, the economic policy had no room for manoeuvre, thus, this country has suffered a slow recovery of domestic demand. In accordance with this, it is important to explore how vulnerable the Hungarian financial sector is in its current condition, and how much it will strengthen or, actually, mitigate the negative impacts caused by Brexit. On the other hand, we explore the room for manoeuvre of fiscal policy in the following years.

4.2.1. Impacts through the financial system

The stability of the financial sector is of critical importance in the performance of the economy. The 2008 financial crisis primarily came as a surprise to the economist community because back then they did not yet attribute such an important role to the financial variables and the directions of research did not include this area. If imbalance emerges and the capital adequacy of the banking sector is damaged or liquidity problems arise, the negative effect on growth of the financial sector, closely connected to the economic participants, deepens the crisis further. In an extreme case, bank panic can evolve, even at European institutions where this would not initially be justified fundamentally. If lending decreases because of bad loans accumulating in the banking sector, growth outlooks decrease in short and medium term as well as a result of the investments not occurring, which can also start a self-induced process via the previously mentioned mechanism. The British referendum and the potential money market turbulence emerging around the negotiations after that may cause a similar initial shock to the Hungarian banking sector as well, this is why it is important to analyse the vulnerability of our financial sector.

4.2.2. Room for manoeuvre of fiscal policy

Based on the Keynesian economic philosophy, the temporary recession after the economic crises can be offset by active fiscal policy, thereby reducing the extent of economic decline and the cost of recessions. If the stimulation of growth is successful, unemployment rate increases less, consumption decreases less, and the contraction of internal demand does not extend the period of the crisis to such an extent. As a result of the correction of growth, economic participants utilise again the free capacities emerging during the crisis, and, hence, the erosion of potential growth during the long recession can be avoided. In parallel

¹⁰ Mercedes, Audi and GM expanded their production capacity with investment of 220 billion HUF during 2010-2011 (110 billion HUF annually), 247 billion HUF during 2010-2013 (82 billion HUF annually), and 137 billion HUF during 2011-2012 (69 billion HUF annually), respectively.

with the dynamisation of the economy, tax incomes increase as well, thus, the budget deficit, caused by the initial fiscal stimulus, decreases, too.

Despite its favourable effects, active fiscal policy can meet with obstacles. In the European Union decisions about the state's budget are made at the level of the member states, however, the violation of rules related to government debt and deficit results in excessive deficit procedure. In addition to legal regulations, financing the deficit can be hindered by market restrictions as well. If investors consider the assets of the given country as too risky, the involvement of funds can be so expensive that the policy stimulating growth finally fails. According to our assumption, the growth reducing impact of Brexit will only have a temporary effect on Hungary and the CEE region, thus, demand stimulating economic policy can be justified. In our analysis we examine using simple calculations what extent of stimulation is allowed by the EU legal regulations and the market restrictions, in the possible alternative paths.

4.3. TIME HORIZON OF THE EFFECT OF THE CHANNELS

Economic output will be held back in both the short term (until the end of 2017) and the medium term (until the end of 2020) by our less favourable external demand, and the costs of investment and lending, which increase as a result of increasing uncertainty, while this impact will be decreased in the first half of the examined period (until 2018) by our improving terms of trade, resulting from decreasing commodity prices, and after 2018 by the foreign direct investment flowing to the continent and Hungary as well (Table 4). The foreign trade channel will have the strongest effect weakening growth, whereas the growth effect of the decrease in remittances and the EU funds is only slight.

The two components of net financing capacity are the current account and the capital account. The net balance of goods and services in current account is reduced by our decreasing foreign trade in both short and medium term, which is partly compensated by our improving terms of trade. The temporary decrease in the remittances of Hungarians living in Great Britain reduces the balance of the current account in the short and medium term. Meanwhile the decrease in EU transfers reduces financing capacity in the medium term via the capital account. In contrast, the reallocation of the British FDI improves financing capacity in the medium term.

Inflation is reduced in both short and medium term by our lower external demand, which effect is strengthened by the oil prices falling in the short term. The decrease in prices is partly compensated by correction in oil prices in the medium term. Moreover, two factors increase inflation on the whole horizon of simulation: the financing costs increasing as a result of uncertainty, and the devaluation of the exchange rate as an effect of the increased risk premium. The inflationary effect of the decrease in remittances and EU funds, and the increase in FDI inflow is negligible.

Table 4: Impact of Brexit on the Hungarian economy via the individual channels

		Foreign demand	EU funds	Uncertainty	Remittances	FDI	Terms of trade
GDP	Short term (2017)	–	0	–	(–)	0	+
	Medium term (2020)	–	–	–	(–)	+	+
External financing capacity	Short term (2017)	–	0	–	–	0	+
	Medium term (2020)	–	–	–	–	+	+
Inflation	Short term (2017)	–	0	+	0	0	–
	Medium term (2020)	–	0	+	0	0	+

Source: MNB

5. Brexit scenarios

The economies of Great Britain and the European Union will be transformed structurally as a result of Brexit, the extent of this and the details of the new system of rules will be outlined in the course of the secession negotiations. Because of the uncertain outcome, we named and quantified three scenarios, all in all these will help in illustrating the real economy effect of the series of events occurring with great likelihood. Before we present the simulations and the real economy effects, we summarise our assumptions applied in the individual scenarios (Table 5).

Table 5: Our assumptions for the channels in the individual scenarios

	Scenario I	Scenario II	Scenario III
Outcome of negotiations	Smooth agreement.	Legal-political separation, economic integration remains partly.	Total exit.
Foreign demand	Slow down of growth is localised to Great Britain. Our foreign demand does not change significantly.	Decline of growth in Great Britain spreads over to the EU, too, our foreign demand changes significantly.	Recession in the UK and the EU.
Terms of trade	Around 10 per cent fall in oil prices until the end of 2017, and correspondingly lower foreign inflation.	Around 20 per cent fall in oil prices until the end of 2017, and correspondingly lower foreign inflation.	Around 30 per cent fall in oil prices until the end of 2017, and correspondingly lower foreign inflation.
Uncertainty	Temporary uncertainty diminishes already in the short term and it will not return in the future.	Uncertainty strengthens again after the temporary period, and remains 50 basis points higher until the end of the negotiations.	High volatility of the money markets remains permanently. Risk premium increases by 100 basis points, and diminishes only slowly because of the uncertain outcome of the negotiations.
FDI	Essentially unchanged FDI flow to Hungary.	FDI surplus in the CEE region (200 billion HUF in Hungary) because of the uncertainty and the decline in UK growth.	FDI surplus in the CEE region because of the uncertainty and the decline in UK growth.
EU funds	British payments remain unchanged until the end of the fiscal cycle.	EU budget decreases by nearly two-thirds of the British net payment.	British payment will fall completely from the EU budget.
Remittances	Free flow of labour. Minimal effect because of revaluation (GBP weakens by 10%).	Free flow of labour. Larger revaluation effect (GBP weakens by 13%).	Free flow of labour terminated at the end of 2018. Significant revaluation effect (GBP weakens by 16%).

Source: MNB

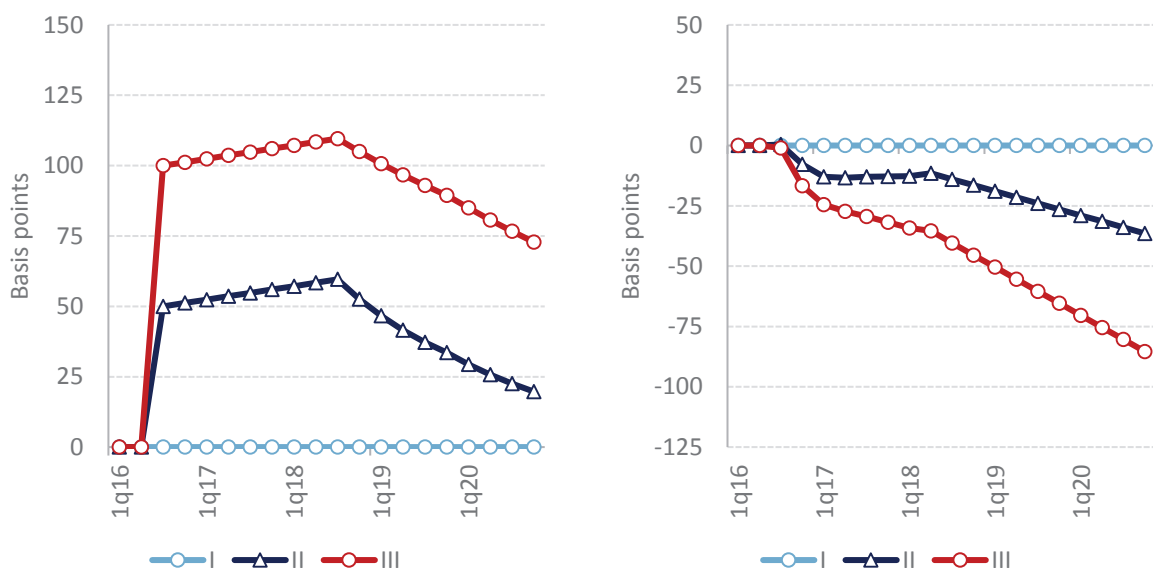
5.1. SCENARIO I

In Scenario I the economic impact of Brexit is mild and is localised primarily to Great Britain. As a result of the referendum, the British secession takes place within two years. However, such an agreement is concluded in the course of the negotiations whereby the exit occurs only on the legal and political levels. Currently there are examples for this kind of economic relation with the EU, Norway and Switzerland have a deeply integrated relation with the EU, yet they do not have member state status.

According to our assumption, in this scenario a small extent of political and economic uncertainty is expected. However, the leaders of the member states succeed in co-ordinating the negotiations with such communication and results that the uncertainty will disappear soon, after a temporary period. The liquidity management and co-ordinated communication of the large central banks also play an important and sufficient role in this, these are considered and accepted as authentic by the markets (Chart 4, right panel).

The vulnerability of Hungary has decreased significantly in the recent period as a result of the economic policy measures, as a consequence of which the uncertainty related to the negotiation process after Brexit does not increase the risk premium of Hungary (Chart 3, left panel).¹¹

Chart 4: Our assumptions related to domestic risk premium (left panel) and eurozone interest rate (market yield expectations, right panel), deviation from the baseline



Source: Bloomberg, MNB

The international real economy effect of Brexit will appear in the path of the relevant EU macroeconomic variables only for a shorter period and to a smaller extent. We assume that after the official exit the uncertainty remaining until the finalisation of the new economic relations and the contracts will have its effect for a short term and to a small extent. The rearrangement of the foreign trade relations will cause a temporary slow down in the British economy and the EU as well, but there will be no recession. The new economic relations will be settled soon. Moreover, EU growth will be corrected

¹¹ Let us note that the increase in the risk premium after the referendum has been corrected completely. The CDS spreads and the government bond yields have fallen below the level before the referendum.

with the restoration of business confidence and the reorganisation of trade. In the medium term there will be a correction in the level of output as well and growth will return to its previous trend (Table 2, Chart 5). The oil demand decreasing as a result of the international slow down will reduce oil prices by 10 per cent until the end of 2017 (Chart 6), which offsets somewhat the decrease in Hungarian export demand via the improvement of our terms of trade.

The EU budget remains unchanged until the end of the fiscal cycle in harmony with the remaining closer relations (Table 6). Furthermore, we assume that the free flow of labour will remain and, in harmony with this, only a fraction of the people working temporarily in England will lose their jobs as a result of economic slow down, until they find a job in another Western European EU member state. And in the case of people who will continue to work in Great Britain, the devaluation of the pound (Chart 7) will decrease the purchasing power of the incomes transferred home.

Table 6: Assumptions related to the payment of funds in the 2014-2020 EU budget cycle

	I (HUF billion)	II (HUF billion)	III (HUF billion)	I	II	III
2016	0	0	0	0%	0%	0%
2017	0	0	0	0%	0%	0%
2018	0	-15.9	-38.4	0%	-1.2%	-3.0%
2019	0	-63.6	-153.5	0%	-5.0%	-12.0%
2020	0	-63.6	-153.5	0%	-5.0%	-12.0%

Source: MNB

5.2. SCENARIO II

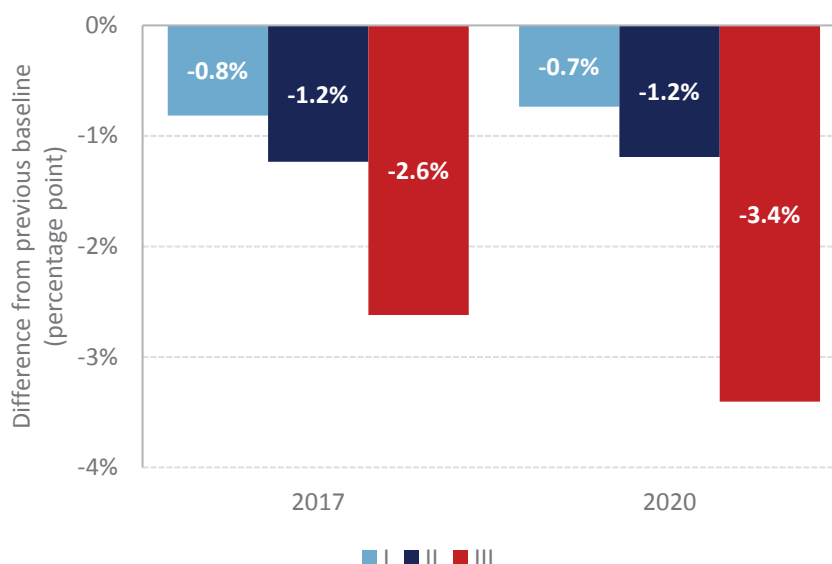
During the simulation we assume that, as a result of the referendum, the British secession will start in the autumn and it will be implemented within two years, by the end of 2018. Naturally, several open questions will arise during the negotiations in connection with the exit. However, the negotiating parties will, with smaller tensions, be able to conclude an agreement in which the economic integration will remain partly, despite the legal and political separation. Political uncertainty will increase after the British referendum, however, this will not have a contagious impact on the other member states.

As a result of the economic and political uncertainty, in the medium term we expect higher market volatility and the increase of 50 basis points of the risk premium (of extent identical with the immediate reaction of the CDS spread) and the remaining of this during the secession negotiations. The communication and intervention of the large central banks (liquidity management and monetary easing) will be capable of handling the initial money market disturbances in a co-ordinated manner. As a result of this, we can observe further easing by the ECB in order to stimulate growth (Chart 4), while risk premiums will decrease gradually with the conclusion of the negotiations. Foreign interest rates increased with the risk premium will be higher in the short term. However, in the medium term these will be slightly below the level assumed in the basic path.

After the official exit, the uncertainty remaining until the finalisation of the new economic relations and contracts can set back growth already in the short term, which primarily affects the British economy. The rearrangement of the foreign trade relations can lead to a temporary recession in the British economy and the EU as well. The slow down of the EU economy will, however, be only temporary, since the new

economic relations will be settled sooner within the Single Market. EU growth will be corrected with the decrease in uncertainty and the reorganisation of trade (Table 2, Chart 5). Oil demand decreasing as a result of the international slow down will reduce oil prices by 20 per cent until the end of 2017 (Chart 6), which offsets somewhat the decrease in Hungarian export demand via the improvement of our terms of trade.

Chart 5: Changes in the level of Hungary's GDP based foreign demand in the various scenarios



Source: MNB

According to our assumption related to the EU budget, with the secession of the UK their per capita net payment will decrease to the level of that of Switzerland – to about 40 per cent of their net payment until now –, as a result of which the funds received by Hungary will fall nearly 5 per cent (Table 6). In addition to the decrease in EU funds, the Hungarian internal demand and the current account will be reduced by the temporary decline of remittances as well. With respect to remittances we assume that, in addition to the continued free flow of labour, one-fourth of the people working temporarily in the UK will lose their job as an effect of the decrease in demand. The temporary decrease in the remittances of people losing their jobs will be corrected already in the short term as they find a job in another Western European EU member state. And in the case of people who will continue to work in Great Britain, the devaluation of the pound (Chart 7) will decrease the purchasing power of the incomes transferred home, in an extent almost one-third larger compared with the level assumed in Scenario I.

5.3. SCENARIO III

Among the alternative scenarios we also took into account a case that has more considerable macroeconomic impact and money market volatility. According to our expectations, the likelihood of realisation of such a case is smaller than that of the two scenarios described earlier, however, its macroeconomic impact may be significant. If serious disputes will surround the British secession negotiations, and there will be no agreement by the deadline, then WTO-type trade relations will come into force. Money market volatility will increase gradually and risk of contamination may increase in other European countries, too. As Váradi et al (2016) warn, as a result of the structural problems of the European Union and the uncertainty of its institutional system, the secondary channel effects may

strengthen in the European Union as well in the medium term. The problems present in the banking system of the eurozone periphery may escalate, which can further deepen the recession in the European Union. Political uncertainty will deepen as a result of the unfavourable economic processes. As a result of Brexit, the unsolved problems – generated by the 2008/09 economic crisis, dragging on for a long time – may trigger substantial growth effect on (an)other country(ies) as well.

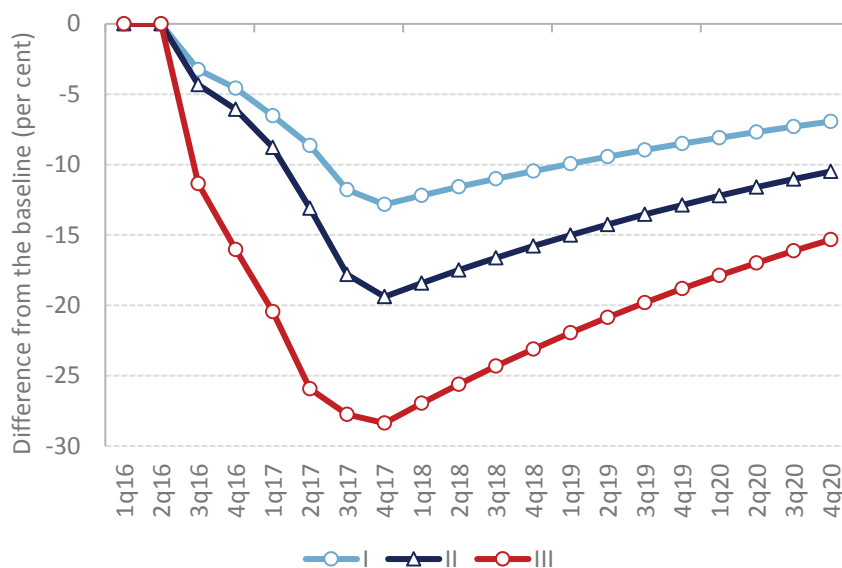
As a result of the assumptions formulated in Scenario III, we can calculate on permanently higher market volatility and risk premiums (Chart 4). The increase in Hungarian premium of 100 base points will remain until the end of the negotiations, then it will gradually decrease after that. Even the co-ordinated reaction of the large central banks and the communication of the leading EU institutions cannot offset the market turbulence.¹² As a consequence of the worsening mood of investors, the eurozone periphery countries and some more vulnerable emerging countries will come under market pressure. Due to turbulences in banking system, financing costs will increase and the extent of economic decline will strengthen.

The transformation of the foreign trade relations can be felt already in the short term and it is of greater extent than in the alternative scenarios presented above. Trade relations can adjust easier within the Single Market, but the establishment of customs and the potential secondary channel effects can set back the growth of the British and the EU economies by a more significant extent in the medium term, because of the trade possibilities less favourable than in the baseline path. British recession may drag on because of the permanently high uncertainty and the rearrangement of the foreign trade relations, and the British pound may weaken considerably. However, the inflation impact of the weakening pound may be offset by the decrease in demand. The slow down of the European Union will be aggravated by the escalating problems of the banking system, and there will be a recession in 2017 (Table 2 and Chart 5). The decreasing oil demand will reduce oil prices substantially already in the short term (by 30 per cent until the end of 2017, see Chart 5), which offsets somewhat the decrease in Hungarian export demand via the improvement of our terms of trade.

After the expiration of the two years, in lack of an agreement, the payment of Great Britain will fall completely from the EU budget, which will not be supplemented by the member states by the end of the cycle due to internal tensions. The EU funds received by Hungary will decrease by 12 per cent, the largest possible amount, from the end of 2018. The Hungarian internal demand and consumption are further decreased by the fall in remittances. In the short term the devaluation of the pound (Chart 7) will decrease the purchasing power of the incomes transferred home to an extent almost two-thirds larger compared with the level assumed in Scenario I. Furthermore, we assume that free flow of labour between Great Britain and the continental Europe will end up by the end of 2018. With the spread of the crisis to the entire EU, the Hungarian employees losing their job in the UK will have more difficulty in finding work in the other member states, thereby decreasing the income transferred home in the short and medium terms as well.

¹² It is expected that the eurozone interest rates will decrease as a result of the further easing of the ECB, compensating the slow down. Foreign interest rates increased with the risk premium will be higher in the short term, however, in the medium term these will correct back to the level assumed in the baseline path.

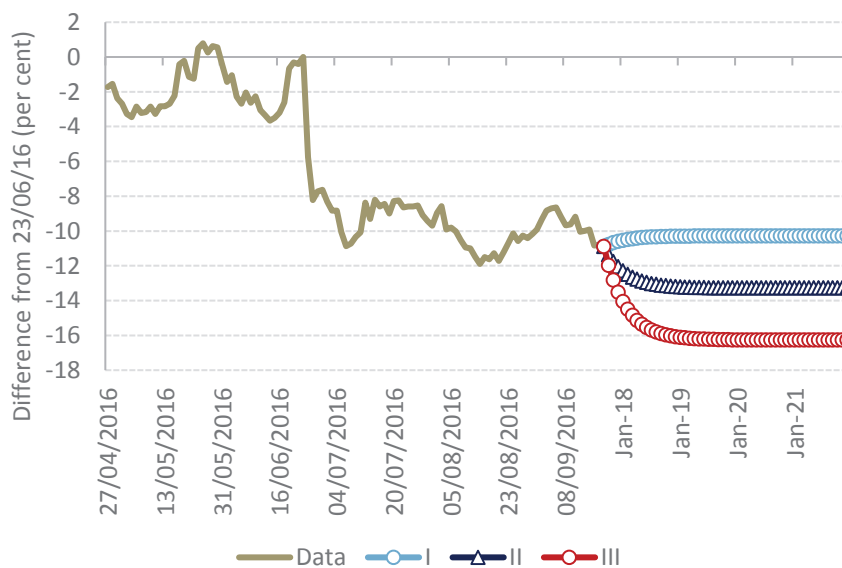
Chart 6: Assumption of Brent oil price



Note: Brent oil prices.

Source: Bloomberg, MNB

Chart 7: Assumption of the GBPEUR exchange rate



Note: Until 20 September 2016 we show daily data, whereas in the forecast horizon we indicate monthly data.

Source: Bloomberg, MNB

6. Results

6.1. THE APPLIED MODEL

We used the new forecasting model of the Magyar Nemzeti Bank for quantifying the effect of Brexit on the Hungarian macroeconomy (Békési et al 2016). This is a calibrated DSGE-type model in which on the one hand the debt limit and heterogeneity of households appear differently from the usual, and on the other hand the financial accelerator mechanism appears via the financing restraint of companies. Moreover, deviating in several points from the hypothesis of rational expectations assumed in the traditional DSGE model frame, it handles expectations flexibly and more realistically. In reality economic participants are not perfectly rational and forward-looking and they partly form their expectations in an adaptive way.

The household block is based on the buffer stock theory connected to the name of Carroll (2001, 2009, 2012). According to this, thanks to the precautionary motive households take into account their wealth position and indebtedness in their consumption and savings decisions, in addition to the changes in their income and real interest rates. Taking into account the indebtedness and heterogeneity of households makes it possible to take into consideration the non-linear consumption behaviour of households, in contrast to the models presenting the usual representative household. In the case of a larger decline, the excessively indebted participants keep back their spending more as a result of debt reduction, which causes prolonged recovery compared to that of our external demand. Thereby it has an important macroeconomic impact, which was shown by Eggertsson and Krugman (2012) and Eggertsson and Mehrotra (2014) as well. Thus, by taking into account the indebted households, the model used for the analysis handles the slow down (decline) emerging as a result of Brexit more realistically.

Corporate investments are basically determined by the real price of capital and changes in demand. Based on the financial accelerator mechanism of Bernanke et al (1999), the real price of capital is also influenced by the wealth position of companies. Thus, the effect of the larger slow down and decline triggered by the secession of the UK, decreasing corporate profits and net wealth, appears in the increase in risk premiums. Therefore, the accelerator effect appears via the larger decrease in investments.

Since Hungary is a small open economy, the external block is determined in an exogenous way, independently of the internal economic processes. The level of detail of the external block of the model is limited, thus, in the course of the calibration of the exogenous shocks, we reached the connections among the external variables with expert judgments. On the one hand, the worsening economic environment holds back the imported inflation directly, on the other hand, it keeps back external pricing indirectly, via the decrease in oil demand and, thus, oil prices as well. In the analysis, therefore, we do not separate the impact analysis of the decline in external demand from either the decreasing external prices, or the easing monetary policy steps aimed at stimulating the economy. We examine the impact of shocks affecting the external – practically exogenous – variables in an aggregate way.

One of the limits of the model is that the connections represent the aggregate variables, relevant for monetary policy. The investments of the private sector represent corporate and household investments in an aggregate way. Government expenditures include government consumption and investments, too. We

calibrated the shocks representing the decline in EU funds in such a way that we took into account the contents of the aggregated variables in the model.

On the other hand, the income flows among the sectors are not developed in such detail as in the DELPHI-model (Horváth et al 2009). We represented the remittances arriving from abroad in such a way that we shocked the disposable income of the households and, as a simplification, we assumed that the households consume the money transferred home in a similar proportion as earned income.

A limit of the application of the model is that, as a monetary policy model, it adjusts to the time horizon of inflation targeting – the impulse responses were calibrated for this period –, whereas the case intended to be examined has a long-term effect on the Hungarian economy, exceeding the time horizon of monetary policy.¹³

In the course of preparing the simulations, we took into account that the linear Taylor-rule in the applied model does not handle the zero lower bound. Therefore, in the simulations we tried to take this into account differently but within linear frames. Thanks to the lower bound of zero, the central bank is practically unable to operate with easing interest rate policy reducing the decline and the decrease in inflation. Therefore, we decreased the sensitivity of interest rate on inflation and demand of the Taylor rule in the model. At the same time, we note that the unconventional tools for liquidity management and economic stimulation, aimed at easing, are available for the monetary policy. However, we do not represent these during the present practice.

Moreover, the linear modelling of the behaviour of the foreign exchange market does not describe reality perfectly. The larger move of the exchange rate entails the closure of the positions of the participants in trade and money markets, which holds back the move significantly. We made this correction via applying shocks in the equation of modified uncovered interest rate parity, based on expert opinion.

6.2. REAL ECONOMY EFFECTS

In this chapter we summarise the result of the simulations. If Brexit is localised to the United Kingdom, the domestic effect will remain small (0.7% decrease in the level of GDP for 2020). If the European Union slows down significantly and there will be recession (Scenario III), the involvement of the Hungarian economy can be considerable. By 2020 the level of GDP decreases by 2.7% via the direct channels, which is only three-fourth of the reaction of our external demand. A significant part of the decrease will occur in the 2017-2018 period. Until 2017, the effect on real growth will not reach 0.5% in Scenario I of Brexit, whereas in the case of Scenario III this will exceed 1.0%, as is shown by Chart 8 and Table 7. (The effect via each channel is displayed in the Appendix.)

¹³ According to our assumptions, Brexit will not affect significantly the aggregate potential level of external demand relevant for the Hungarian economy. In case of a potential structural break, it would primarily cause reallocation of the production capacities between the UK and the EU. Human and physical capital will be re-utilized in the medium term. Because of this, the simulations were made with the cyclical part of the model which was calibrated for the medium term economic consistency. Making simulations with the cyclical part of the model could have deficiency, namely that monetary policy aims to compensate the negative growth and disinflationary effect of economic downturn substantially on the inflation targeting horizon. However, this channel is considerably weakened due to practical reasons, that is, taking into considerations the zero lower bound.

**Table 7: Effect on the growth rate of Hungary via the direct channels
(deviation from the baseline, in percentage point)**

	I.	II.	III.
2016	-0.1	-0.1	-0.2
2017	-0.3	-0.5	-1.1
2018	-0.4	-0.7	-1.2
2019	-0.1	-0.3	-0.5
2020	0.1	0.3	0.3
Average	-0.1	-0.3	-0.5
<i>Aggregate impact on the level of GDP</i>			
2020	-0.7	-1.3	-2.7

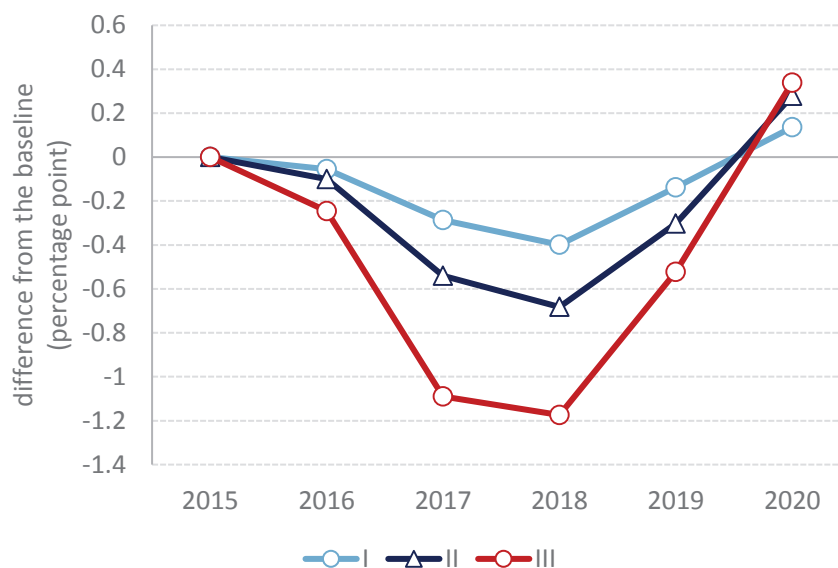
Source: MNB

Of the channels, the foreign trade channel dominates. The largest growth effect of the slow down (or in Scenario III: decline) of external demand appears in 2017 and 2018, in contrast to our international partners, where growth will decrease by the most in 2017. One of the reasons for this is that in the short term the negative growth effect will be reduced by the improvement of the terms of trade and competitiveness, as our net export will adjust to the relative price change in volume as well. The other reason is the heterogeneity of households: indebted households will decrease their consumption as a result of the adjustment of their balance sheet, and the reaction of internal demand causes a more prolonged recovery than that of the external demand. With the recovery of external demand, the slow down (decline) will be followed by a correction in 2020 in all three scenarios, to which the effect of FDI will also contribute after 2018.

The fall of the EU funds does not affect growth in the short term – the status quo will remain until the end of 2018 –, whereas its effect in the medium term is small. In Scenario I the payments of the UK remain unchanged, thus changes in EU funds have no effect on growth even on the medium term. In Scenario II we calculate on a minimal growth impact, since the British will continue to pay, only less (41% of the net payment until now). Even in Scenario III, where the amount of falling EU funds is the largest (however, even here it does not reach 1.5 per cent of domestic investments), the growth effect is hardly less than half a percentage point. However, we think that indirect channels can further mitigate this small effect. Namely, a large part of private sector investments may be implemented, since companies can partially supplement the falling EU funds from market sources with the increase of domestic lending. It is important to note that we quantify the direct effects in the three scenarios and we do not calculate on fiscal policy reaction, i.e. state investments will not be implemented from own funds. We present the evaluation of the room for manoeuvre for fiscal policy in a qualitative manner in Chapter 7 of this study.

The remittances of Hungarians living in the United Kingdom can decrease the most in Scenario III (by 0.1 per cent of the GDP), whose effect on domestic consumption can be less than 0.1 per cent. Consequently, the growth effect of this channel will be limited (remains below half a tenth of a percentage point) in all three scenarios.

Chart 8: Effect on the growth of Hungary via the direct channels



Source: MNB

All in all, Brexit will reduce external financing capacity, yet even the largest impact does not reach 2.5 percentage points. If it remains at around its current level – 7.5 per cent of GDP – in the baseline path until the end of 2020, the financing capacity will remain in positive territory (Chart 8) in the short and medium term in all three possible scenarios.

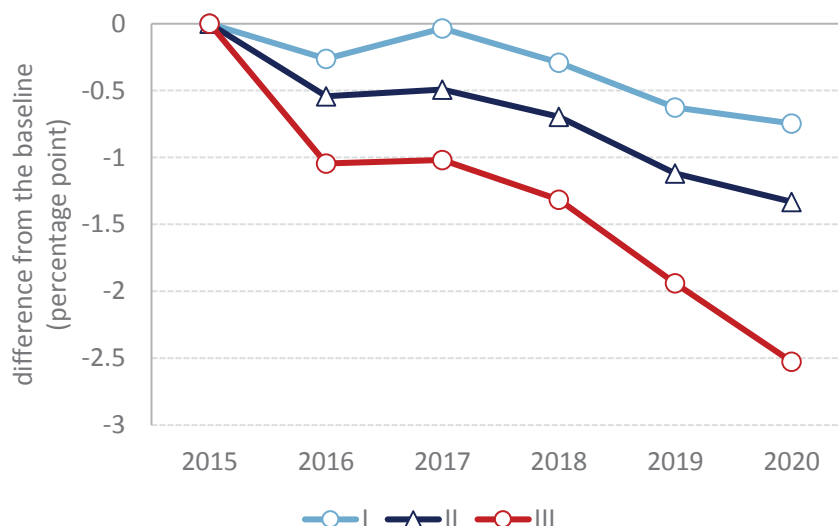
Financing capacity is primarily decreased by our less favourable foreign trade in both the short and medium term, which is partly offset by our improving terms of trade because of the decrease in oil prices in the short term. Moreover, the balance of payments is reduced by the temporarily decreasing amount of remittances on the entire horizon of simulation, as a result of the changing labour market of the United Kingdom. Furthermore, in the medium term, the balance of capital account is reduced by EU funds while raised by capital inflow due to the reallocation of the British FDI.

The net balance of goods and services in the current account is reduced by our less favourable foreign trade in both short and medium term, which is partly offset by our improving terms of trade because of the decrease in oil prices. Several factors affect the income balance. On the one hand, it is reduced by the temporary decrease in the incomes of Hungarians living in the UK, which reduces the surplus of current account balance by 0.1 per cent of the GDP (even in the least favourable case). On the other hand, in Scenario II this is offset, and in Scenario III the surplus of current account balance is increased, by the fact that these scenarios are characterised by lower interest environment and slower expansion of profit rate at the companies. The interest paid on external debt is smaller because of the lower interest environment, moreover, the profit produced by foreign companies in Hungary (and by Hungarian companies abroad) is also lower. In Scenario I the external interest rate and the corporate profit are identical with the baseline path.

According to our assumption, the decrease in EU transfers does not significantly affect the transfer balance even after the conclusion of the negotiations, since the supports paid by the funds appear in the capital transfers, thus, in the balance of capital account. However, the remittances of the Hungarians living in the UK permanently is also displayed in the transfers, which slightly decreases the net foreign current transfer balance as a result of the revaluation.

The balance of capital account is reduced by the decrease in EU transfers after the conclusion of the negotiations (in Scenario II and III) as the subsidies paid by the funds appear in the capital transfers.

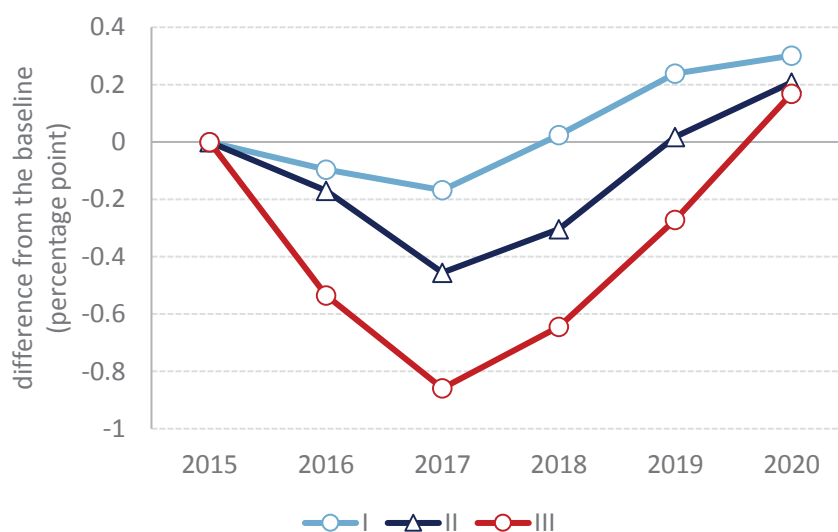
Chart 9: Effect on the financing capacity of Hungary via the direct channels



Source: MNB

Inflation will be lower in the short term and higher after 2018 (Chart 10). The decreasing external demand reduces inflation in both short and medium term, which will be reduced with the correction of external demand by the end of the period. The decreasing imported inflation environment also reduces prices. Moreover, the negative impact is strengthened in the short term by the rapid decrease in raw material prices, correction of which starts to raise prices from 2018. In the entire period of the analysis, the increase in uncertainty has an effect of increasing prices via the rising financing costs and, albeit moderately, the devaluation of the exchange rate. In addition to this, inflationary effect of decrease in EU funds and remittances is negligible. The monetary policy is unable to ease the disinflationary effect near the zero lower bound.

Chart 10: Effect on the CPI inflation of Hungary via the direct channels



Source: MNB

6.3. POTENTIAL SECOND-ROUND EFFECTS

6.3.1. Vulnerability of the financial system

Based on the data of the previous years, we can state that the likelihood of development of negative feedback has decreased significantly in the Hungarian financial system since 2009. Thanks to the measures of the government and the central bank taken in the recent years, the risk stemming from the high ratio of foreign currency denominated loans in households' portfolio has practically disappeared completely. In contrast to the situation in 2008, currently the ratio of household loan portfolio subject to the fluctuation of exchange rates is the highest in the case of Bulgaria, Poland and Romania. The dependence of banks on external funds has decreased considerably, too. As a result of the deleveraging process of the recent years, the loan-to-deposit ratio has fallen to 85 per cent, corresponding to the regional average. The liquidity and capital position of the Hungarian banking sector is strong, risks have decreased significantly (MNB 2016). With this, the position of the Hungarian financial system has improved considerably not only compared to the previous values, but in the international comparison as well. This has also been confirmed in recent days by the decision of Moody's about the improvement of the outlooks of the Hungarian banking system and the upgrade of Hungary by Standard and Poor's to investment category.

The current strong position of the Hungarian financial system suggests that it may only have a limited effect on Hungary if the banking system problems of the eurozone periphery countries increase as a result of money market volatility and economic decline. Namely, the shock-absorbing capacity of the Hungarian banking system has improved significantly since the 2008/09 crisis, and the capacities inherent in Funding for Growth Scheme (FGS) are able to offset the decreasing loan portfolio resulting from the falling funds.

6.3.2. Room for manoeuvre of fiscal policy

As a result of fiscal policy improving the balance, Hungarian budget discipline has improved considerably (Matolcsy 2015). Meanwhile, as an effect of Brexit, offsetting the slow down of economic performance with budget easing may be justified in the given case. Determining the extent of the fiscal multiplier and the possibility of counterbalancing the negative effects have to be examined thoroughly. We do not undertake to perform this in the study, however, we have completed a simple calculation because of its economic policy relevance.

In our simple calculations we accept the deficit and debt path in 2016 and 2017 assumed in the September issue of the Inflation Report. We applied technical projection for the subsequent years. In the course of calculating the room for manoeuvre of the budget, in order to avoid the excessive deficit procedure of Hungary, we took into account the Maastricht criteria related to the budget: the rules related to the decrease in government debt and the deficit target of 3 per cent.

Since economic growth is not affected significantly by Brexit in 2016, fiscal policy can easily compensate this effect this year. Next year, however, further fiscal stimulation beyond the current plans is not possible because of the government debt rule. Based on our simple calculations, the budget will have room for manoeuvre of approximately half a per cent as a ratio of the GDP available in the period of 2018-2020, complying with the 1/20 rule of the EU. The effect of the stimulation depends on the value of the fiscal multiplier. Calculating with a value of around 0.7-0.8, the budget can completely offset the negative real economy effects of Brexit in the case of Scenario I, whereas in the case of Scenarios II and III, resulting in a larger economic decline, the budget can offset these effects only partially.

7. Summary

The result of the British referendum has produced one of the most important changes in the history of the European Union. Thus far it has been unprecedented that an EU member state decides about the termination of membership voluntarily, and there has been a dispute in the European society about the decision of the UK, the stability of the EU and the development of a new, common future. As a consequence of Brexit, the leadership of the EU and Great Britain have to conclude new, bilateral agreements instead of the former economic and legal agreements. However, the outcome of the negotiations, the expectations of the economic participants and the spread of the actual shock to the European economy are surrounded by several uncertainties.

This issue has been examined from several sides in the international publications, however, the quantification of the effects related to the Hungarian economy can be considered as rather partial. In this study, we have prepared a detailed analysis about the possible effect on the Hungarian economy, relying on the new macroeconomic model of the MNB and the knowledge of the expert team of the MNB. In the model, households and companies take into account their wealth position in the course of their consumption and investment decisions. The effect of a larger slow down triggered by the British exit, decreasing corporate profits and net wealth, appears in the increase in risk premiums. Therefore, the accelerator effect appears via the decrease in investments. Moreover, taking into account the indebtedness and heterogeneity of households makes it possible to take into consideration the non-linear consumption behaviour of households, in contrast to the models presenting the usual representative consumer. Thanks to this, the model captures the slower recovery after the decline – as a result of debt reduction – more realistically.

We have presented the mechanism whereby the international effect of Brexit can spread to Hungary. In the course of this we have taken into account the role of the primary and secondary channels as well. The impacts spreading via the European Union dominate because of the lack of significant direct trade connections. The most significant channel is foreign trade, thus, if Brexit is localised to the United Kingdom, the domestic effect will remain small (annual GDP growth will be lower by 0.2% on average until the end of 2020). However, if the European Union also slows down considerably (there may even be technical recession), the involvement of the Hungarian economy can be more pronounced, too (annual GDP growth will be lower by 0.5% on average until the end of 2020, which is three-quarters of the reaction of our external demand).

During the analysis we took into account the effects via secondary channels as well, which have come to the fore increasingly. The vulnerability of the financial system is low, and the active fiscal policy is capable of compensating a moderate growth effect, with balanced budget and decreasing government debt.

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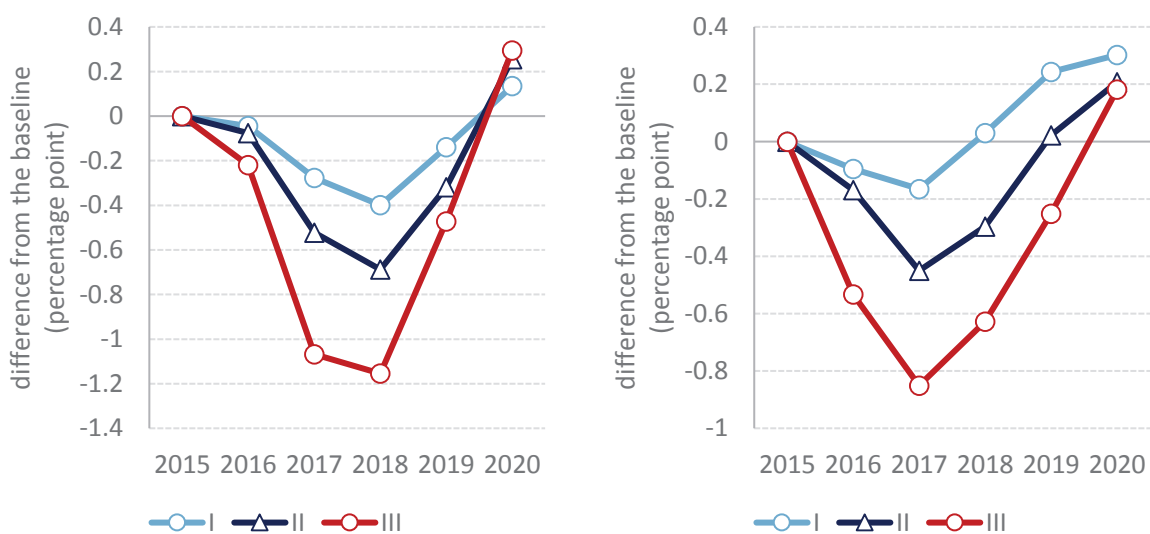
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9. Appendix

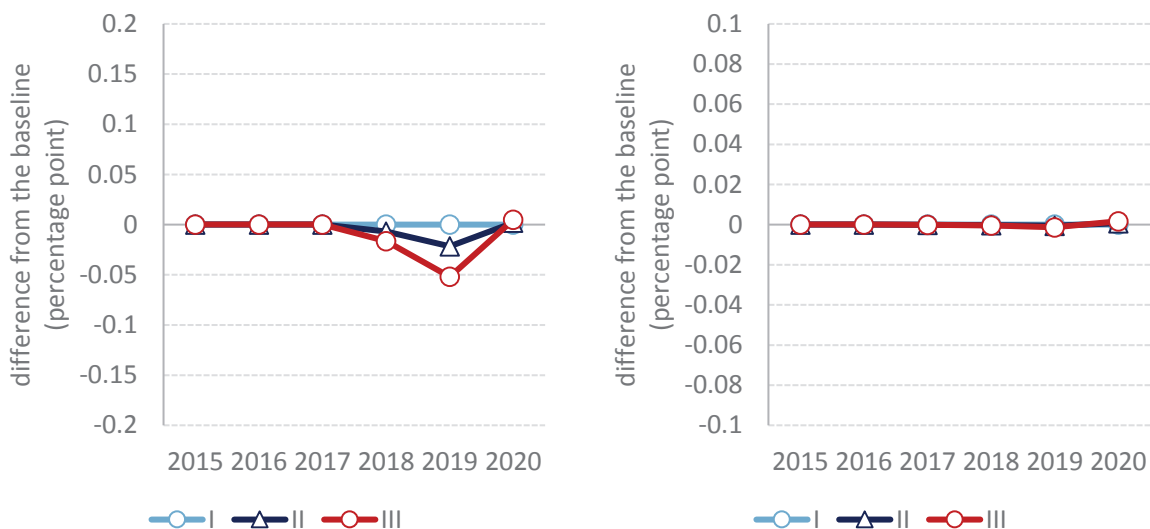
Although the impact of exogenous assumptions on growth is quantified in the main text of the study, presenting the effect of each channel can further help in the understanding of the processes. The resolution will help reveal the relative role of the channels for the main economic variables. Exogenous assumptions are divided into the following categories: foreign trade (Chart 11), EU funds (Chart 12), remittances (Chart 13), and reallocation of the British FDI (Chart 14).

Chart 11: Effect on Hungarian growth (left panel) and inflation (right panel) via foreign trade channel



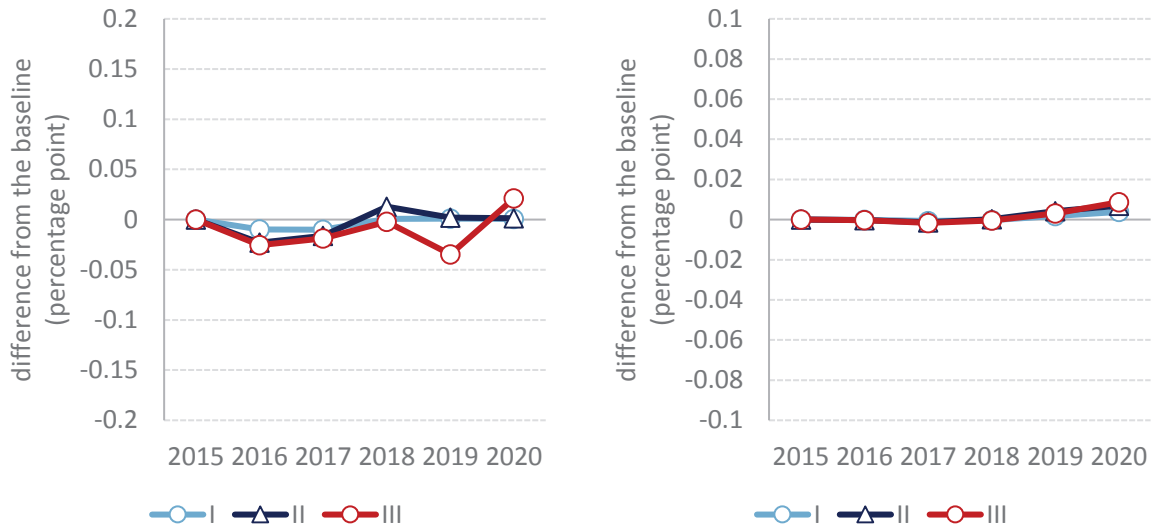
Source: MNB

Chart 12: Effect on Hungarian growth (left panel) and inflation (right panel) via EU funds channel



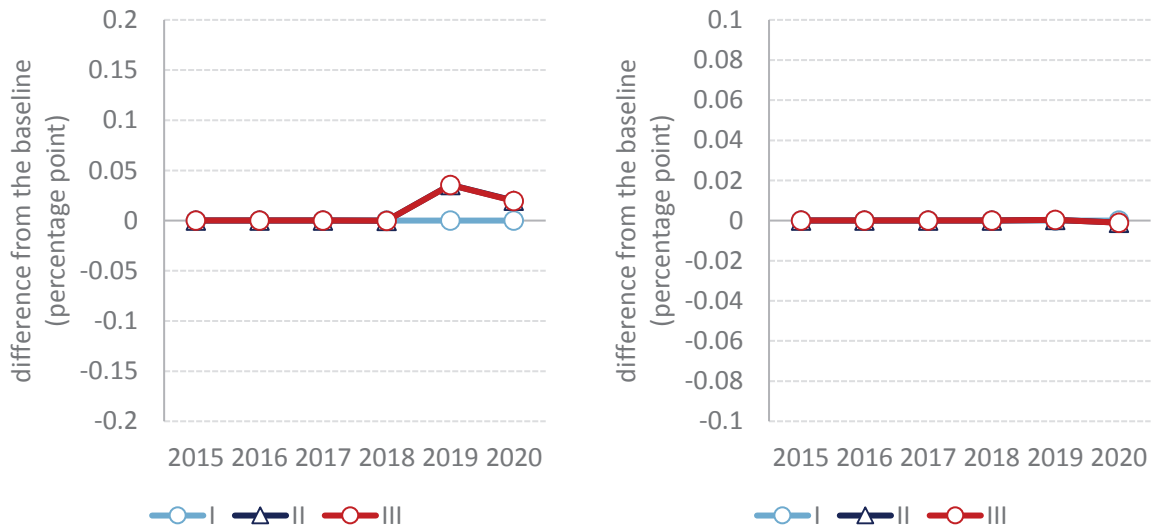
Source: MNB

Chart 13: Effect on Hungarian growth (left panel) and inflation (right panel) via remittances channel



Source: MNB

Chart 14: Effect on Hungarian growth (left panel) and inflation (right panel) via reallocation of the British FDI channel



Source: MNB

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