HUNGARY

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HUNGARY

SELECTED ISSUES

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HUNGARY'S PUBLIC DEBT STRATEGY: NEW RETAIL GOVERNMENT SECURITY[1]

This note describes and discusses potential implications of recent changes in Hungary's public debt strategy. Special attention is paid to the motivation for, and recent experiences with, the "Hungarian Government Security Plus Scheme" (MÁP+) for physical persons, introduced in June 2019. One of the main benefits of retail bonds is that they usually are perceived as more stable funding. However, it is argued that MÁP+ should be continuously monitored to ensure its objectives are achieved in the most cost-efficient manner and to avoid unintended distortions.

1.   **The note is organized as follows.** It starts with a description of the general principles of public debt management and how Hungary is applying them. Second, it discusses recent developments in Hungary's public debt. The third part focuses on specific public debt management policies in Hungary. The fourth part briefly discusses experiences with the retail bond programs in other countries but focuses mainly on the MÁP+ bond, the initial experience with this bond, and elaborates on its potential implications. The last part concludes.

A.   General Objectives for Public Debt Strategy

2.   **The stated mission of the Hungarian Government Debt Management Agency (ÁKK) is broadly in line with best practices.**[2] Public debt management is typically guided by a combination of objectives to ensure prompt payment of obligations at the lowest possible costs over the medium term.[3] While low funding costs are important, they should also reflect risks and externalities. Costlier liabilities may thus be merited to ensure market presence, prompt access in case of need, and reduced vulnerabilities. While there should be separation of public debt management and monetary policy objectives and accountabilities, there should also be a shared understanding to limit mismatches.[4] These may involve exchange rate, interest rate, maturity, and thus roll-over risks.

- *The choice between domestic and foreign currency denominated and external funding should strive to achieve a broad investor base with due regard for cost and risks, while*

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[1] Prepared by Kamil Dybczak and Tonny Lybek.

[2] According to ÁKK's website: "The mission of ÁKK is to finance the government debt and the central government deficit at the lowest costs in the long run taking account of risks, at a high professional level and by using sophisticated methods."

[3] According to the IMF's 2014 *Revised Guidelines for Public Debt Management* (page 7): "The main objective of public debt management is to ensure that the government's financing needs and its payment obligations are met at the lowest possible cost over the medium to long run, consistent with a prudent degree of risk."

[4] Ibid, guideline 1.3 on policy coordination. Paragraph 16 (ibid) elaborates: "… A goal of cost minimization over time for the government's debt, subject to a prudent level of risk, should not be viewed as a mandate to reduce policy interest rates or to otherwise influence domestic monetary conditions. Neither should the cost/risk objective be seen as a justification for the extension of low-cost central bank credit to the government, nor should monetary policy decision be driven by debt management policy considerations."

***treating investors equitably.*[5]** For instance, continued presence in international markets may facilitate access if suddenly needed. On the other hand, unhedged foreign exchange rate risks can be costly in case of volatile markets. Moreover, foreign investors may suddenly change behavior due to unrelated external events, which can be disruptive, particularly in case of illiquid markets. It can also be useful to consider a sovereign asset-liability management approach to gage the financial risk exposure of the public sector as a whole (Das et al., 2012). Attention to the external exposures of the private sector and its market access may also be warranted. Even if there is no immediate need from a public debt perspective, there could be other reasons, like the need to boost international reserves to influence the perceived sovereign risk, or if the government is able to raise foreign currency much cheaper than the private sector, depending on the private sector saving-investment balances.

- ***The choice between retail—individuals with small transactions—and wholesale funding should, among other objectives, aim at developing an efficient government securities market.*** While some government securities may be designed to target certain groups to achieve better rates, other objectives may also be at play, including to encourage a savings culture as well as to increase financial literacy and inclusion. In contrast, a segmented domestic market makes such securities less liquid and thus more expensive compared to bonds with standardized features, which can facilitate a secondary market. Finally, market development is a germane externality, like developing a broad investor base with due regard to both cost and risks and establishing a yield-curve to nurture efficient domestic mortgage and commercial bond markets.

Strategies of Hungarian Public Debt Management

3.   **The global financial and euro debt crises elucidated the importance of: (i) lowering public debt levels; and (ii) reducing external debt vulnerabilities.** This can be achieved by increasing domestic savings and the domestic financing of the debt by further developing the domestic investor base (ÁKK, 2019, page 12). According to the ÁKK's annual "Debt Management Outlook" the primary objectives of Hungary's public debt management can be summarized as follows:

- ***Support a debt reduction.*** Basic Hungarian legislation prescribes that if the (*cash*) debt of the *central* government exceeds 50 percent of GDP, the Parliament is obliged to adopt a budget reducing this ratio. Furthermore, as an EU member, Hungary is also expected to reduce its (*accrual*) general government debt currently exceeding 60 percent of GDP by at least 1/20 each year of the difference between the actual debt and the aforementioned threshold.

- ***Reduce external vulnerabilities.*** The global financial crisis proved to the Hungarian authorities that non-resident holdings of government securities were less stable (MNB, 2019, p. 66). Even if foreign investors hold HUF denominated bonds, if they sell, they will likely convert to foreign currency, hence also affect the size of international reserves and potentially influence the exchange rate. Specifically, Hungary experienced a situation where one large foreign investor, with a significant share of the Hungarian public debt, adversely affected the government

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[5] Ibid, guideline 6.1 on diversification of instruments and portfolios.

securities market by suddenly changing its investment strategy. The reduction of this external vulnerability has been achieved by:

- ○ ***Reducing the share of foreign currency (FX) denominated public debt "to acceptable levels."*** The share of FX denominated debt has been gradually reduced. According to Barcza (2018), the reduction of FX denominated was facilitated by reducing the reliance on external investors, who typically prefer FX denominated debt. Beginning 2019, the target range for the share of FX denominated *central* government debt was lowered to between 10 to 20 percent. In addition, ÁKK hedges its non-euro FX debt by swapping into euros, while allowing for 5 percent deviation of the actual FX denominated amount.

- ○ ***Enhancing the domestic investor base, particularly smaller retail investors.*** Only around three percent of retail securities are sold back to the retail primary dealers before maturity (Barcza, 2018).

B.   Hungary's Public Debt

4.   Hungary's public debt has been on a declining path but remains elevated compared to regional peers (Table 1). Hungarian general government debt peaked at 80.8 percent of GDP in 2011. It has been reduced to 70.2 percent of GDP by end-2018, and it is expected to further decline. This is due to both lower overall deficits and the negative differential between the real interest rate and potential growth. Nonetheless, the government's 2018 gross financing needs remained high at 21.6 percent of GDP. But ample global and domestic liquidity make the high annual gross public financing needs easy to refinance.[6]

Table 1. Hungary: Selected Public Debt Indicators of Hungary and Peers

	Hungary		Czech Republic		Poland		Romania		Slovakia	
	2018	Δ 2018-2014	2018	Δ 2018-2014	2018	Δ 2018-2014	2018	Δ 2018-2014	2018	Δ 2018-2014
	(Percent of GDP, unless otherwise indicated)									
General Government Public Debt	70.2	-6.6	32.6	-9.6	48.9	-1.5	35.0	-4.2	49.4	-4.1
o/w Long-term (loans and securities)	57.6	-8.6	31.5	-7.8	48.4	-1.8	33.8	-2.7	47.9	-5.2
o/w Residents:	44.6	9.6	19.5	-9.7	24.5	2.8	18.2	-1.2	20.9	-0.1
o/w held by financial institutions	29.3	3.4	18.8	-8.0	22.0	2.2	17.3	-1.1	20.4	-0.4
o/w Long-term	25.9	4.4	18.6	-6.2	21.9	2.2	16.9	0.0	20.0	-0.6
o/w held by households	14.4	6.8	0.2	-1.7	1.0	0.4	0.2	0.2	--	--
o/w Long-term	6.6	3.2	0.2	-1.7	0.9	0.4	0.2	0.2	--	--
Non-residents:	25.6	-16.2	13.1	0.1	24.5	-4.3	16.7	-3.0	28.4	-4.0
o/w Long-term	24.6	-15.8	12.2	0.0	24.5	-4.3	16.7	-2.9	27.8	-4.6
o/w FX denominated	16.1	-14.2	3.9	-3.8	15.1	-2.6	17.6	-5.1	2.5	-1.8
Annual gross public financing needs 1/	21.6	-0.5	4.9	2.9	5.9	-2.2	7.5	-1.6	4.3	-6.1
Memorandum items:										
Public foreign currency denominated debt in percent of gross international reserves	77.2	10.6	65.2	-19.7	72.8	-13.6	96.8	1.7	...	...
Sustainability (r_{real} - $g_{potential}$), percent 2/	-4.9	-4.5	-3.2	-0.3	-1.8	-1.7	-5.1	-5.2	-4.2	-4.5
Gen. government guarantees 3/	5.1	-0.7	0.2	-0.2	1.4	-0.2	2.2	-0.3	--	--

Sources: Eurostat, respective national Public Debt Offices, and Fund Staff calculations.
1/ According to IMF staff estimates. In case of Poland, the 2018 figure is preliminary. In addition of change of budget deficit and interest rates, projections can change due to buy-backs, maturity extensions, etc.
2/ Real interest rate of 10-year bond (r) minus potential growth (g). The stock of existing public debt in percent of GDP declines, all other things equal, when r-g is negative.
3/ Most recent available data are from 2017.

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[6] See Annex I on public debt sustainability in the 2019 IMF Staff Report on Hungary.

5. **The external vulnerability of Hungarian public debt has been significantly reduced**. The decline in the share of both FX denominated and non-resident held government securities is appreciable. When Hungarian public debt peaked in 2011, foreign currency denominated debt amounted to 48½ percent of *central* government debt (Figure 1). This share has since been more than halved to 18¼ percent by September 2019. The decline was facilitated by a decline of the share of government securities held by non-residents from about 40 percent to just below 25 percent during the same period. This has been mirrored by an increasing share of residents' holding, particularly of retail government securities, mainly held by households, but also wholesale bonds held by financial institutions, primarily banks.

Figure 1. Characteristics of Hungarian Public Debt, 2010–2019

Sources: Eurostat, ÁKK, Barcza (2018), and IMF staff calculations.
1/ Share of *central* government debt.
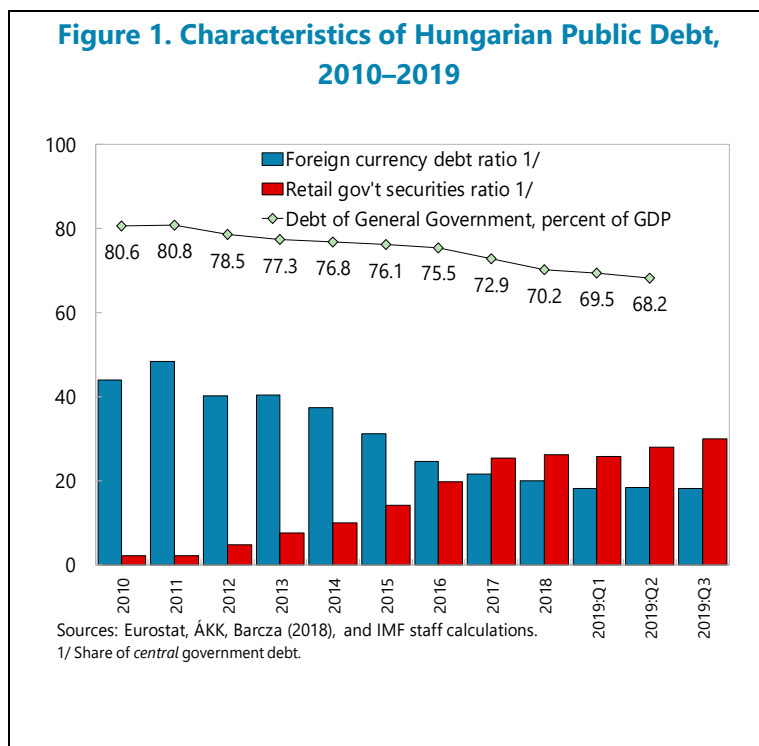
6. **Active public debt management has been instrumental in reducing vulnerabilities.** While external demand for Hungarian public debt has remained strong during this period, generous excess liquidity in the domestic banking system and increasing savings of households, due to their deleveraging following the global financial crisis, opened opportunities for active debt management. These were utilized by both the ÁKK and the Hungarian Central Bank (Magyar Nemzeti Bank, MNB) to increase the share of government securities: (i) denominated in local currency; (ii) held by residents; and (iii) with extended maturities.

C. Active Public Debt Management in Hungary

7. **Two main policies have impacted the structure of public debt during the recent period:**

- **ÁKK's *Retail Securities Program*.** Special retail securities tailored to various household needs were developed and offered at a premium. It was also made easier and cheaper to purchase these securities in the local treasury offices as well as banks.[7] Initially, banks could purchase these securities in the secondary market. ÁKK has since introduced restrictions, limiting potential arbitrage and helping ÁKK's cash management. Banks are now required to offer ÁKK such securities. The share of retail bonds of total *central* government debt thus increased from about 2⅓ percent in 2011 to almost 26¼ percent at end-2018. Households, however, began to pause

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[7] The ÁKK pays banks a commission to encourage such sales. Banks may still charge their clients additional fees. Nevertheless, many individuals prefer to use their bank, although it is cheaper for them to use the Treasury.

their portfolio adjustment since 2016, among other reasons likely due to lower yields (MNB, 2019, p. 66).

- **MNB's *Self-Financing Program* combined with the ÁKK's *Wholesale Program*.** In March 2014, the MNB initiated its "*Self-Financing Program*." The primary objective of lowering foreign currency denominated and non-resident holdings of public debt seemed achievable, as Hungarian banks held substantial excess liquidity with the MNB.[8] The MNB gradually adjusted its various monetary policy instruments—mainly by limiting how liquid they were—hence encouraging banks to place their excess liquidity in government securities instead of with the MNB. In addition, the MNB offered conditional interest rate swaps to entice purchases of government securities with longer maturities. Bank holdings of government securities increased from about 15 percent of GDP in March 2014, to 21 percent at end-2016. This ratio has declined to about 19 percent of GDP by mid-2019, but banks' holdings still increased in nominal terms. Nagy and Kolozsi (2017) have estimated that the yields of government securities were lowered by 75–90 bp due to this program. It was part of a general easing-cycle that further lowered funding costs.

8.   **Within the limits prescribed by the overall debt objectives and strategy, ÁKK has continued to be very active in the market.** Bonds with longer maturities have been issued and various retail bonds have been tailored to meet specific needs. The ÁKK has been skilled in using market opportunities to do buy-backs and bond-exchanges with a view to reduce refinance risk. The ÁKK, in order to maintain a targeted reserve with the single treasury account, uses a range of cash management tools, including repurchase agreements.

D.   Government Securities Programs for Individuals

9.   **Several countries have promoted government securities for individuals, but some of them have been closed in recent years, mainly due to cost considerations.** Such programs may be merited to compete with bank deposits and transaction fees. Government securities may be designed to target certain groups. Some retail borrowing programs are used to encourage a savings culture as well as to increase financial literacy and inclusion. Such securities are typically intended for *buy-and-hold*. To lower funding costs, securities should ideally be as liquid as possible to capture the "liquidity premium".[9] This should be evaluated against the premium from catering to special demands and market segmentation. Some countries have offered standard securities to individuals, but lowered fees and commissions, particularly if standard bank fees were prohibitive for small transactions, and/or offered tax incentives. Sale before maturity may still involve the assistance of a broker, as in the case of *Treasury Direct* in the USA, while other countries offer the possibility to directly sell back the security to the government, like in South Africa. Previously Canada, Germany, Sweden, and the UK had relatively large retail programs, but new issuances have since been sharply reduced or even stopped due to being more expensive, when including administration costs, than

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[8] In early 2014, monetary and financial institutions held MNB securities of about 13 percent of GDP.

[9] For different approaches on how to calculate the liquidity premium, see, for instance, Sarr and Lybek (2002).

wholesale funding. Moreover, in a low interest environment such securities became less attractive compared to bank deposits with increased deposit insurance.

The New Hungarian Retail MÁP+

10.   A new bond (*Hungarian Government Security Plus Scheme* (MÁP+)) was introduced to Hungary's retail bond program in June 2019. The stock of outstanding retail securities amounted to just over 17½ percent of GDP at end-2018, the bulk of which (HUF 5,800 billion, or about 13½ percent of GDP) were held by individuals. In April 2019, the authorities announced their intention to increase households' holdings of retail government securities to HUF 11,000 billion by 2023 (about 19 percent of projected 2023 GDP, including through issuing MÁP+).

11.   The declared primary objectives of MÁP+ are to reduce external refinancing risk, sustain a high savings rate of households, and reduce cash hoarding. While the primary objective is to further reduce external vulnerabilities through domestic issuances, the authorities aim to support a continued high savings rate. The MÁP+ should help contain consumption, imports, and take the pressure off the real estate market in the near term. Furthermore, by offering higher yields, the authorities aim at activating part of the increasing cash holdings. Notwithstanding that the MÁP+ yield is higher than current wholesale funding, the authorities believe that given the aforementioned objectives "the decline in risk spreads supports a reduction in the interest expenditures of the budget" (MNB, 2019, p. 68). MÁP+ is intended to substitute some of the existing shorter maturity bonds, hence extending the average maturity.[10]

12.   MÁP+ offers some very attractive features. MÁP+ has an initial yield of 3.5 percent the first half year, 4 percent in the second half year, whereupon it increases by 50 bp each year until it reaches 6 percent by the end of its 5-year maturity. The simple average annual yield amounts to 4.95 percent. The interest is automatically reinvested but can be redeemed without charges. Apart from the 5-day period when interest is paid, investors can redeem the securities at any time for a fee not exceeding 25 basis points. Last but not least, the interest income from retail government securities for households has been exempt from taxation since June 2019, while, interest income on bank deposits remains taxable. In case the securities are sold before maturity, the ÁKK has the right to buy them back to avoid arbitrage. Hungarian physical persons can open an account with the treasury and purchase MÁP+ free of charge, and there is no lower or upper limit for amounts purchased. If purchased via a bank, there may be additional fees and commissions.

Initial Experiences with MÁP+

13.   It is too early to assess whether the objectives are being achieved, but the initial demand has exceeded expectations. As of end-September 2019, about HUF 2.1 trillion (just over 4½ percent of GDP) MÁP+ had been issued, while total retail government securities amounted to about 19 percent of projected GDP. Almost half of purchases appear to be funded from roll-overs
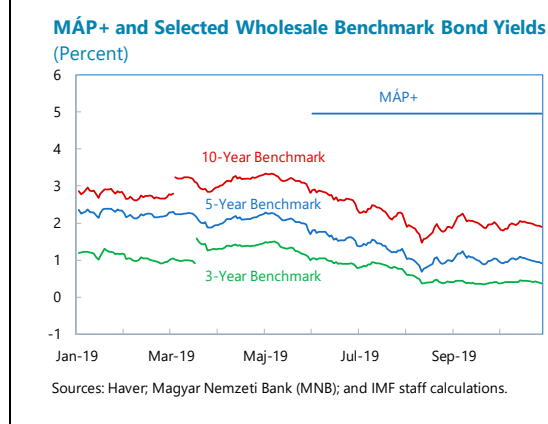
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[10] The following retail bonds are being phased out: FMÁP (half-year government security); 2MÁP (2-year government security); BMÁP (bonus security); and KTJ+ (treasury savings bill plus).

and sales of other retail government securities. Another 10-15 percent are from investment funds, including property funds.[11] It is estimated that around 10 percent of the funding has come from bank deposits. Market observers estimate that up to 10 percent of the funding has come from a smaller increase in currency in circulation. The remaining part reflects increased savings. According to some market observers, many new accounts for these securities have been established, but about 70 percent of the sales have been to account holders with addresses in the capital area. Anecdotal evidence suggests that the interest for residential housing for investment purposes in Budapest has eased after the introduction of MÁP+.

Potential Implications of MÁP+

- **The return on MÁP+.** The return on this security is above the market but the authorities consider it a fair price to pay for the aforementioned objectives. MÁP+ are nominally costlier for the budget than current domestic wholesale or external funding (Figure 2). Although the initial interest rate on the MÁP+ is 3.5 percent, the simple average annual yield is, as previously noted, 4.95 percent. The latter should be compared to the yield on the domestic 5-year domestic wholesale benchmark, which has declined from 1.7 to a record low 1.0 percent between mid-June and September. The Hungarian government has not recently issued a Eurobond, but with the current CDS spreads and swap rates, this alternative also seems cheaper. However, when the interest rate on MÁP+ was originally determined, it was only about 20 bp higher than the yield of a 5-year inflation-linked retail bond (PMÁP), based on the MNB's inflation projections at that time.

Figure 2. MÁP+ and Selected Wholesale Benchmark Bond Yields (Percent)

Sources: Haver; Magyar Nemzeti Bank (MNB); and IMF staff calculations.

- **Opportunity cost.** A few market observers are of the view that the same demand could have been achieved by a lower yield. If they were to be right—which is a strong assumption—perhaps, it would have been possible to achieve similar sales by an effective yield of 3 percent. The excess pricing solely due to the MÁP+ issued during Q3 2019 would have cost the budget an extra HUF 41 billion, or about 0.1 percent of GDP. However, compared to the 5-year wholesale benchmark interest rate (1.01 in September 2019), the additional budget expense is larger (almost 0.2 percent of GDP). For illustrative purposes only, if the current difference between the annual average MÁP+ yield and the current annual interest rate of the 5-year wholesale benchmark bond (1.01 percent in September) is applied to the half the declared retail bond target sales by 2023 (HUF 11,000 billion) and this half would be issued solely as MÁP+, the additional expense would, all other things equal, amount to almost ½ percent of GDP. This

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[11] Property funds have thus far offered comfortably returns given the booming real estate market, but they are taxable and not risk-free. With a view to enhance financial stability, new investors in property funds have since June 2019 only been able to redeem these securities within 180 days compared to previously 2 days.

amount would obviously be smaller if: (i) other types of less expensive retail bonds continue to be purchased by retail investors; and, (ii) the interest rate on larger wholesale funding increases over time. The latter is likely given the current record low interest rate and in the case of higher demand. Potential savings from the lower interest rate could be used to further reduce public debt or invested to boost potential growth and sustain faster convergence. Finally—albeit a theoretical issue—higher funding costs at the margin should in principle reduce the expected net present value of some public investment projects, which should therefore be revisited.

- **Arbitrage opportunities.** The authorities are trying to contain potential arbitrage opportunities. Some dealers were initially promoting MÁP+ to foreign individuals. ÁKK has since encouraged those dealers to focus their sale efforts on residents. Nevertheless, according to market observers, it is still possible for individuals with good credit rating to borrow abroad in euros, convert to HUF, buy MÁP+, and swap the return in HUF back into euros, and still make a profit— which partially reflects the sovereign risk. Another opportunity initially limited but explicitly prohibited effective October 14, 2019, was to use MÁP+ as collateral for loans with Hungarian banks, for instance to buy additional bonds.

- **Yield curve effect.** MÁP+ pricing will affect the relative prices of other funding sources. Currently, banks' loan-to-deposit ratio is well below 100 and they generally have a comfortable LCR. Hence retail government securities do not appear to crowd-out bank deposits to an extent that would affect new bank lending. Nevertheless, over time more expensive government retail debt could potentially increase the funding costs of banks, hence making borrowing more expensive.

- **External risk reduction considerations.** The shadow price of external vulnerability is affected by the already reduced external exposure as well as by the fact that Hungary's net external debt position is projected to improve. The presence in the international markets and additional rating upgrades could further lower financing costs. Moreover, Hungary's net international debt position is projected to become positive in late 2021. It means that the cost of external financing could perhaps be smaller than currently perceived. However, it may still not be attractive if there is low tolerance to foreign exposure due to a perceived or real concern that the probability of new global shocks is increasing.

- **Other fiscal and market considerations.** In addition to borrowing costs, there are other fiscal considerations. The higher funding costs of MÁP+ will increase the budget deficit, but the extension of maturities could reduce the annual gross financing needs in the near term. The average maturity of the retail portfolio has already increased from 18 to 30 months. MÁP+, however, is akin to a reduction of the personal income tax on savings. While it has been designed to be accessible to all individuals, the wealthier individuals are likely to benefit the most. In addition, the bond may be effective in reducing spending and the demand for real estate of the middle class, it is less convincing that the wealthy individuals would behave in the same way. Instead, they might move their investments from riskier investments to the safer MÁP+. The impact of exempting interest earnings of government securities from taxation seems ambiguous, as it may influence the distribution of savings toward government bonds and away from other financial assets. Finally, while tax revenue can increase somewhat due to the higher

interest income generated by MÁP+, this would be moderate since interest income of government securities for individuals is no longer taxed. The additional tax revenue would only come from VAT on any increased spending generated by the bonds.

- **Monetary and credit policy implications.** MÁP+ mitigates the adverse impact of negative real interest rates on households—a consequence of the accommodating monetary policy. Arguably, MÁP+ could even enable prolonging the accommodative monetary stance: the adverse impact on private consumption and housing investment of the very accommodative monetary stance is now contained and would thus be less likely to necessitate an early tightening. Generally, the accommodating monetary policy contributes to aggregate demand, including private consumption and investment of households, while the objective of MÁP+ is to boost savings of households and curtail aggregate demand. Finally, some recalibrations of day-to-day liquidity management by the MNB are needed to account for the share of bank deposits and cash in circulation used to buy MÁP+.

E.   Conclusion

14.   A key objective of public debt management is to strike balances between reducing the cost of funding and limiting vulnerabilities. MÁP+ has many reasonable objectives, although some of them, such as higher a savings rate of households and reduced external indebtedness, are to a major extent driven by macroeconomic policies. Going forward, the question remains whether these objectives can be achieved by appreciably lower cost to the budget given less expensive alternative funding sources and policy options. Ultimately, it is a political decision how to weigh the opportunity cost of reducing external vulnerabilities, refinancing risks, maintaining a high savings rate of households, reducing cash hoarding, and how to redistribute budgetary resources. However, a few market observers believe that the same objectives could be achieved at less cost and with fewer distortions. Some presence in and continued access to diversified markets—including international markets—are also important and appear to be much cheaper than the MÁP+ given current market conditions. All other things equal, during Q3 alone, MÁP+ has cost the budget almost 0.2 percent of GDP extra per year compared to the similar domestic wholesale benchmark bond. Hungary's external vulnerabilities have declined significantly since the global financial crisis due to active public debt management and external debt is projected to decline even without MÁP+. The shadow price of further reducing foreign currency denominated and external funding risks thus reveals the authorities' perceived risks of new external shocks.

15.   Public debt management also needs to respond to changing market conditions. A good example in this regard is the ÁKK's decision, announced late October 2019, to lower the interest rate on some retail bonds beginning early November 2019, as well as to cut the distribution fees to banks beginning 2020. As the authorities continue to issue retail bonds, they may want to continue to review their programs, including MÁP+—ranging from pricing, maturities, to sales channels—as market conditions continue to change. Consideration should also continue to be given to diversification and presence in international markets.

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DETERMINANTS OF CURRENCY IN CIRCULATION IN HUNGARY[1]

This note reviews various factors that may help explain the increase of currency in circulation. In Hungary—like in most countries with a few notable exceptions—currency in circulation per capita and in percent of GDP has increased over time, despite the availability of more efficient non-cash payment and savings instruments. While this can be attributed to higher real incomes as well as low interest rates and inflation, in Hungary the increase in cash holding also appears to coincide with the introduction of the financial transaction tax in 2013.

1.   **The note is structured as follows.** First, we describe general trends in cash usage and then in Hungary and its regional peers. Second, we discuss main factors driving the demand for cash as suggested by the literature. Special attention is paid to factors and measures that have likely affected cash usage in Hungary. Third, building on the literature, we estimate both a panel version as well as a univariate model for Hungary. The final part concludes.

A.   General Observations on Currency in Circulation

2.   **Currency in circulation—here the terms cash and paper currency are also used interchangeably—is a subset of money, which primarily performs the functions of means of exchange and store of value.**[2] In principle, the decision to use cash instead of non-cash alternatives should reflect a cost-benefit analysis. The main benefits of using cash are: (i) liquidity and reliability as it, per definition, is legal tender;[3] (ii) convenience for small transactions; and (iii) anonymity.[4] On the other hand, the main cost of using cash is that it does not yield a return in the form of an interest rate. In addition, cash handling is costly, especially when the sunk costs of alternative electronic payment instruments have already been made.[5] Since currency in circulation has increased in most countries, this suggests that cash may have gained importance as a store of

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[1] Prepared by Tonny Lybek and Kamil Dybczak.

[2] In this paper, we look at use currency in circulation outside the central bank (not outside commercial banks).

[3] In Hungary, there are no limits on the number of respective *banknote* denominations that venders are obligated to accept. Recently, some countries have permitted stores not to accept cash (e.g., in Sweden, some shops, museums and restaurants now only accept card or mobile payments, while in Denmark some stores can refuse cash during night times to reduce the risk of crime).

[4] The new blockchain technology, for instance, now also offers anonymity.

[5] In Germany, Krüger and Seitz (2014, p. 109) estimated that cash and cashless payment services accounted for at least 2 percent of GDP without considering qualitative factors. Achord et al. (2017) estimated that the costs of cash handling in advanced economies was around 0.45 percent of GDP and up to 3 percent of GDP in India. Zandi et al. (2013), covering 57 countries during 2008–12, estimated that electronic payments alone contributed to real GDP growth by, on average, 0.2 percentage points for advanced economies, and 0.8 percentage points in emerging markets. Zandi et al. (2016) broadened the analysis to 70 countries during the 2011–15 period and assessed that increased use of card payments alone annually contributed to additional 0.1 percent of GDP due to improved efficiency.

value (Bech et al., 2018), likely facilitated by low—in some countries even negative—nominal interest rates.

3. The amount of cash in circulation may indicate trust in the currency and the financial system. The level of cash partially reflects the degree of trust and confidence in the currency, particularly if it is used as a savings instrument. High level of foreign currency (FX) denominated cash compared to local cash—i.e., high level of "dollarization"—implies lack of trust. On the other hand, high levels of cash in circulation could also reflect lack of trust in the financial system. This can happen during and after a systemic banking crisis; in periods of high risks and uncertainty about collection of credits, which motivates more reliance on prompt cash payments; or in case the cost of non-cash services is prohibitive, including due to taxes. Furthermore, cash may also dominate if the shadow economy is substantial.

4. The use of cash has important consequences for the economy, notwithstanding the fact that these changes often are gradual and thus frequently ignored in the short run. In the long run, the use of cash, depending on the availability of non-cash alternatives, affects transaction costs and thus the efficiency and competitiveness of the economy, which may not always be adequately captured by standard measures.[6] The Hungarian Central Bank (Magyar Nemzeti Bank, MNB) has thus suggested various initiatives to make the payment system more efficient.[7] Furthermore, in the medium term, increased use of electronic payments may help reduce the shadow economy (EY, 2017). In the short run, cash influences the calibration of monetary operations and the seigniorage.[8]

5. Currency in circulation in percent of GDP has been increasing in most countries, including in Hungary, despite new technologies which increased the efficiency of non-cash payments. The use of cash seems to be declining only in countries where forceful efforts have been made to promote non-cash alternatives. Sweden is a case in point, where cash in circulation has continuously been declining to below 1½ percent of GDP. In contrast, in Japan—with a long period of very low interest rates and inflation—the trend has been increasing and now currency in circulation exceeds 18 percent of GDP.

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[6] Ilyés and Varga (2016) found—applying a general equilibrium model to Hungarian data—that substituting cash with debit cards, in successive order, would: (i) improve the efficiency or resources already available; (ii) reduce the deadweight loss of cash services; and (iii) release resources from the costlier cash payments.

[7] The Hungarian Central Bank's *Competitiveness Program in 330 Points* (MNB, 2019A) includes improve electronic payment solutions (point 22), support instant payment services (points 25 and 26), and incentivize banks to reprice retail payment services (point 27).

[8] Rogoff (2016, page 2) noted: "The effect of curtailing paper currency on tax evasion alone would likely cover the costs of profits from printing paper money, even if tax evasion fell only by 10–15%. The effect of illegal activities is probably even more important." Moreover, he argued that paper currency—particularly large denominations— hampers the use of negative interest rates as a monetary policy instrument.

Cash in Circulation in Hungary

6.   In Hungary, currency in circulation in percent of GDP has doubled since 2004, and now exceeds 14 percent of GDP. After the global financial crisis, cash in percent of broad money (M3) began to increase, but this trend has recently begun to decelerate. While the introduction of the financial transaction tax coincided with increasing use of cash since 2013, efforts to reduce the shadow economy may have contributed to the recent deceleration in the use of cash. Comparing Hungary to regional peers, only the Czech Republic has a higher amount of cash holdings in Euros per capita (Figure 1), partially due to higher income per capita. The Euro Area (EA) and Switzerland have higher amounts of paper currency per capita in Euros, but in part due to the much higher income per capita, and in part because their bank notes are also widely used by non-residents outside of the country of origin.

Figure 1. Currency in Circulation in Selected Countries

Currency in Circulation, 1998 - 2019
(Percent of sum of last four quarters' nominal GDP)

Source: Haver Analytics, National Authorities, and IMF staff calculations.

Currency in Circulation in Selected EEA Countries, 2018
(Euros per capita)

Sources: Haver Analytics; and IMF staff calculations.
Selected non-Euro Area EU countries plus Norway and Bosnia and Herzegovina.

Currency in Circulation, 1998 - 2019
(Percent of Broad Money (M3))

Sources: Haver Analytics, National Authorities, and IMF staff calculations.

Currency in Circulation in Selected Countries, 2018
(Percent)

Sources: Haver Analytics; and IMF staff calculations.
Note: Selected EU countries, Bosnia and Herzegovina, Norway, and Switzerland.

B.   Typical Determinants of Cash Usage

7.   Income, interest rates, and inflation are standard determinants of cash demand. In general, cash in circulation tends to increase when income per capita increases (income effect). Cash holdings are also affected by the opportunity costs of not holding alternative payment and savings instruments (substitution effect). Specifically, higher interest rates on alternative assets increase the opportunity costs of holding cash and thus reduce the demand for cash. Higher inflation may have

an ambiguous impact on demand for cash. On one hand, higher inflation may increase demand for cash for payment purposes, as goods and services become more expensive. On the other hand, the opportunity cost of holding cash becomes higher, as the value of other assets may increase.

8.   To explain differences in both trends and levels across-countries, the standard determinants should ideally be supplemented with additional factors. Economic policy uncertainty and financial sector stability may impact the preference for cash, as previously noted. Moreover, a broad range of governance policies could potentially affect the use of cash. They may include better rule of law, control of corruption, effectiveness of the government, ethics of private firms, etc., as these components all affect trust in the government and the banking system. Furthermore, the structure of the economy, including historical and institutional factors, matter. This can be partially captured by socio-economic factors, level of education, income inequality, access to the internet, and the structure of the economy. For example, if tourism or agriculture account for a large share of the employment, there may be greater reliance on cash (Alonso et al., 2018). Finally, demographic factors may also influence the use of cash, as older people tend to be less inclined to accept new payment instruments. In short, both the level and the trend of cash in circulation reflect numerous country specific factors, with the main ones summarized in Table 1.

Table 1. Hungary: Generic Factors Affecting Currency in Circulation

	Impact on currency in circulation when left-side variable increases	Comment	Proxy indicator
Macroeconomic factors			
Income per capita	+++	Income effect	CDP per capita
Interest rates	--	Substitution effect	Money market rates or yields of benchmark government securities
Inflation	-- / +	Reduces value of cash, but increases the need for transactions	CPI
Economic risk and uncertainty			
Economic policy stability	+/-	Trust in currency and the sovereign, but likely also more trust in financial system	Economic policy uncertainty indices (global, regional, and domestically) Indices for sovereign and currency crises
Financial sector stability	--	Trust in financial system	Indices for systemic banking crises (Laeven and Valencia, 2018)
Demographics			
Share of older population	+	Older population may be reluctant to electronic payment	WB World Development Indicators
Socioeconomic factors			
Economic structure	+	Larger share of economy in agriculture, tourism, higher inequality, and fewer highly educated	WB World Development Indicators
Financial deepening	-	Broad money and credit to private sector in percent of GDP	WB Global Financial Development Database
Digitalization	-	Easier access to electronic payments	WB Global Financial Development Database
Governance indicators	-	Rule of law, government effectiveness, control of corruption, ethics of private firms, etc.	World Wide Governance indicators, WB Doing Business, Global Competitiveness Index

Source: Authors' priors, inspired by Alonso (2018).

9.   A traditional money demand function can easily be converted to a cash demand function and be elaborated with additional pertinent factors. Demand for broad money typically captures transaction, precautionary, and speculative motives. Its most basic form is often described by equation (1). The real stock of money increases with income and declines when the interest rate increases. This formula can be converted to a demand for cash equation and be elaborated by the various factors described above, as indicated in equation (2). Obviously, some of the determinants are interdependent.

(1) $M/P = L(Y,r)$

(2) $Curr/P = L(Y, r, P, Risk\&Uncertainty, Demographics, Socioeconomic, Governance)$

10.   Empirical evidence supports that cash holdings are correlated with the standard explanatory factors. Using a large panel of countries not affected by "dollarization," Jobst and Stix (2017) found that cash holdings per capita in real terms have continued to increase in recent years. This has been partially explained by higher average income (GDP per capita) and lower interest rates. Nonetheless, they also found that financial crises helped explain the increase in cash holdings, which they contributed to the accompanying greater uncertainty. Lybek and Dybczak (forthcoming) found, using a broader sample, that the influence of systemic banking crises was less pronounced, but was stronger in individual countries impacted by a systemic banking crisis. Jobst and Stix (2017) did not find that changes in the size of the shadow economy impact the demand for cash. Using a broader range of governance indicators to capture trust and efficiency of governments, Lybek and Dybczak (forthcoming) found that some of these indicators help explain cross-country effects, while others, like perceived corruption, was only significant in some countries.[9]

C.   Hungarian Specific Factors

Financial Transaction Tax

11.   The impact of the financial transaction tax introduced beginning 2013 has been widely debated. The question was whether the tax on cash withdrawals would spur the use of electronic transfers or instead, cause an increase in circulating cash (Ilyés et al., 2014).[10] The tax has since been amended several times. Effective February 2014, the incidence on cash was significantly reduced by allowing two free ATM withdrawals per month not exceeding in total HUF 150,000 (about €450). The current tax rate is 0.3 percent for financial transactions and 0.6 percent for cash withdrawals (not covered by the above-mentioned exemptions) that are above HUF 20,000 by physical persons. The tax is capped at HUF 6,000 (about €19) per transaction (but no cap on large cash withdrawals). The tax on payments by credit cards is a flat fee of HUF 800 per card per year (HUF 500 in the case of the special contactless cards). Banks are not allowed to directly charge the client for the financial

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[9] Generally, measures to improve the rule of law, predictable contract enforcement, and thus financial intermediation can have sizable payoffs, not just in using non-cash payment and savings instruments, but also by lowing the net interest margins of banks. See Annex II in IMF Country Report 18/252 and Jarmuzek and Lybek (2018).

[10] Some market observers have noted that the financial transaction tax initially was considered a source of revenue that would compensate for negative externalities of the financial system following the global financial crisis.

transaction tax on ATM withdrawals, but they recover it in other ways. Total revenue from the financial transaction tax amounts to about 0.5 percent of GDP, of which the bulk are on corporate transactions. Beginning 2019, all transactions by individuals below HUF 20,000 were exempted in order to promote the forthcoming instant retail payment system.

12.   The introduction of the financial transaction tax in 2013 coincides with increased use of cash in Hungary. Basic econometric tests that were conducted suggest that there was a structural break in currency in circulation in percent of GDP, just before the financial transaction tax was introduced, as the population was expecting the tax and tried to avoid its impact.[11] The tests were based on monthly data, where GDP was annualized by splitting quarterly GDP equally on the three months of the quarter.

Shadow Economy

13.   Hungary has introduced comprehensive measures to reduce the shadow economy, which may have contributed to the recent decelerated growth of currency in circulation. In September 2014, electronic cash registers with remote audit capability became mandatory and the coverage of the activities requiring them has since been gradually broadened (OECD, 2019). Since July 2018, all VAT registered tax payers must submit invoices with at least HUF 100,000 VAT content in real-time. These efforts help shrink the shadow economy[12] (and tax evasion) as well as the use of cash. Consequently, VAT revenue collection has consistently surprised on the upside in recent years.

Payment Instruments

14.   Cash is primarily used by households, but also by small- and medium-sized enterprises (SMEs) and even larger corporations. According to data from the electronic cash registers, the share of cash transactions—both in volume and value—are gradually declining but still account for the majority (Table 2). Ilyés and Varga (2015) found that the preference for cash tends to be higher for those with only primary education, the young and elderly, the unemployed, students, as well as the rural population.

Table 2. Hungary: Electronic Cash-Register Transactions, 2015–2017			
	2015	2016	2017
	(Percent, unless otherwise indicated)		
Number of transactions, billions:	3.63	3.74	3.82
Cash payments	90.0	87.7	84.8
Card purchases	8.7	10.4	12.6
Other payments	2.5	3.1	3.1
Value of transactions, HUF billions:	9,134	9,780	11,011
Cash payments	74.3	71.5	67.8
Card purchases	21.7	23.7	25.7
Other payments	4.0	4.8	6.5

Source: Magyar Nemzeti Bank. Reproduced from MNB (2019B).

Note: The sum of the shares of cash, card, and other payment transactions may exceed 100 percent because there can be transactions where multiple payment methods used at the same time.

Cash payments are also popular among Hungarian corporations.[13] If their income is more cash-based, they are more inclined to use cash to pay their expenditures, including salaries. It is

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[11] LR, Wald, and cumulative sum tests for parameter stability were used.

[12] Medina and Schneider (2018), for instance, estimated that the share of the shadow economy already declined from about 25 percent of GDP in 2000 to about 20 percent in 2015.

[13] In 2007, regulation was introduced requiring corporations to have internal rules on cash handling. In 2009, it was tightened, limiting cash holdings to 1.2 percent of the revenue of the previous year. This regulation was gradually eased and by end-2012, companies could again set their own limitation on cash holdings.

noteworthy that given their already high use of cash, in 2017 about 73 percent of surveyed Hungarian micro-, small-, and medium-sized enterprises reported that the financial transaction tax did not affect their payment practices (Belházy et al., 2018).

New Instant Retail Payment System

15.   Hungary is planning to introduce an instant retail payment system in March 2020. It will cover credit transfers up to HUF 10 million (€31,250), which will be settled within 5 seconds (compared the 10 seconds being the European maximum benchmark). It only requires having a mobile phone number within the European Economic Area (EEA) or an email address, and a domestic tax identification number. The system is currently being tested to ensure its reliability. In contrast to other countries, the system is mandatory for all domestic banks. To the extent its pricing is appealing,[14] and it proves reliable, it should help reduce the number of cash transactions. However, the fact that transactions over HUF 20,000 will remain subject to the financial transaction tax may impede its success.

Savings Instruments

16.   The distribution of banknote denominations can be used to gage the extent to which cash is used as a savings instrument. In the case of Hungary, the share of the volume (value) of the two largest denominations—HUF 20,000 (€60) and HUF 10,000 (€30)—has since 2010 increased from 56 (91) to almost 70 (over 94) percent of all issued banknotes (Figure 2). These denominations, however, are within the typically recommended range.[15] Moreover, they are smaller—even when compared to GDP per capita—than the large denominations in Switzerland (CHF 1,000), the Euro Area (€100), and the USA ($100).[16]
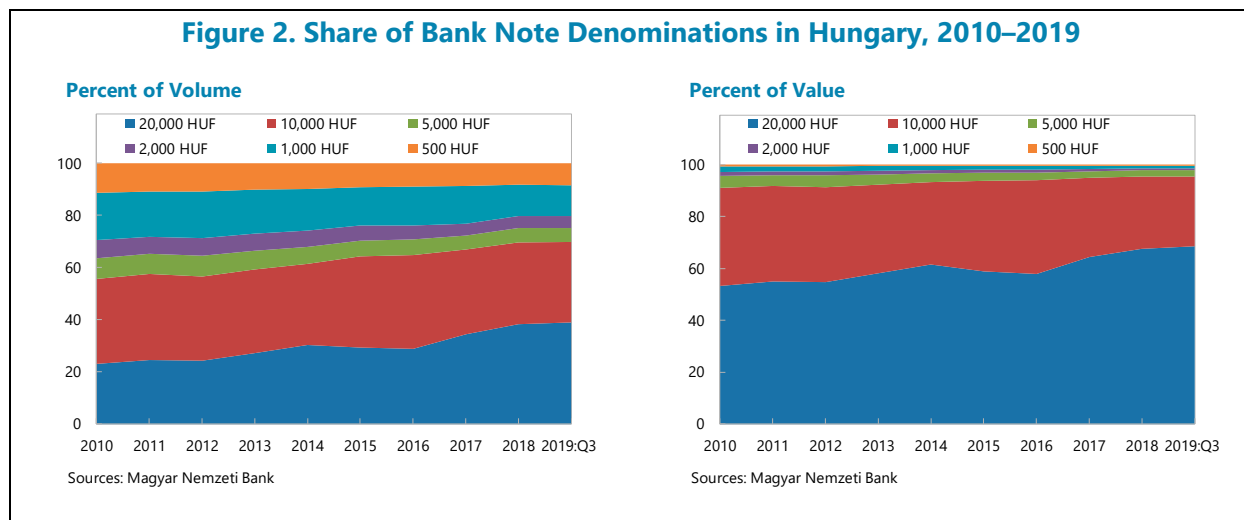
17.   Hungary's new retail government bond (MÁP+) was intended to also absorb cash but has thus far only had a limited effect. The MNB estimates that less than 10 percent of the purchased MÁP+ have substituted cash. From June to end-September, the total issued MÁP+ amounted to about 4½ percent of GDP. Thus, it seems that cash hoarders are not willing to give up their cash even for the handsomely remunerated, but electronically registered, 5-year bond with the annual average yield of about 5 percent. Nonetheless, MÁP+ has only been introduced in June 2019, therefore the impact on cash could become more pronounced later, when the bond becomes more popular among those depending more on cash.

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[14] The prices of non-cash payment services relative to net wages, are high by international standards, even when adjusting for the financial transaction tax (Chapter 4 in MNB, 2019B)

[15] In 1980, L. C. Payne and H. M. Morgan suggested the *D-metric system* to determine the denomination of coins and banknotes. The largest denomination should be within two to five times the daily net average pay, and the second largest denomination within the daily net average pay and twice that amount.

[16] The Federal Reserve has stopped issuing $10,000, $5,000, $1,000, and $500 notes, while the ECB stopped producing the €500 bills in 2014.

Figure 2. Share of Bank Note Denominations in Hungary, 2010–2019

Percent of Volume

Percent of Value

Sources: Magyar Nemzeti Bank

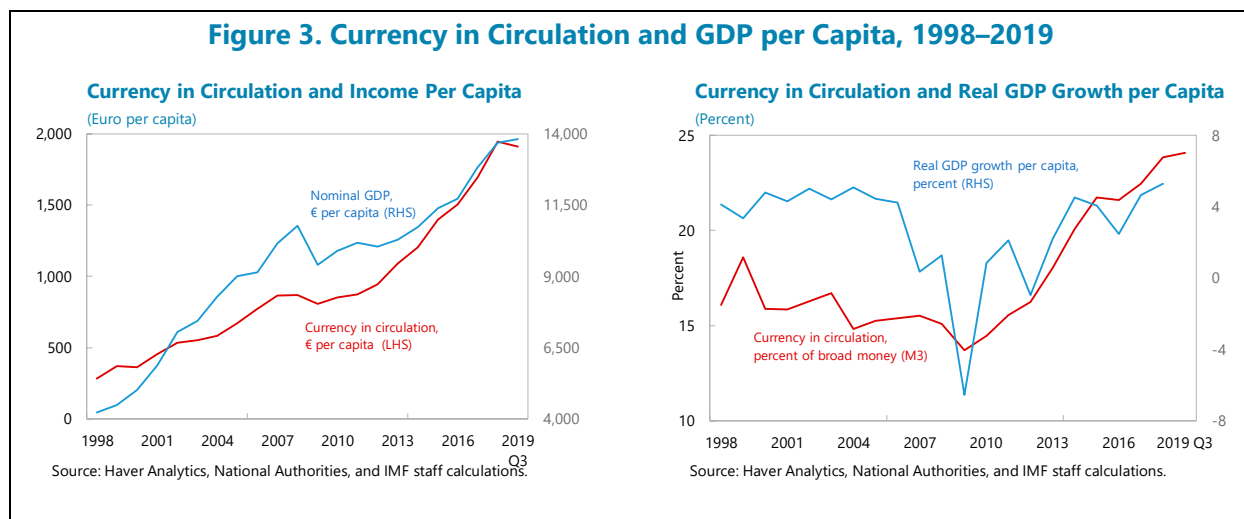Sources: Magyar Nemzeti Bank

D.   Stylized Facts on Cash Demand in Hungary

18.   Developments in income per capita, interest rates, and inflation strongly correlate with use of cash in Hungary.
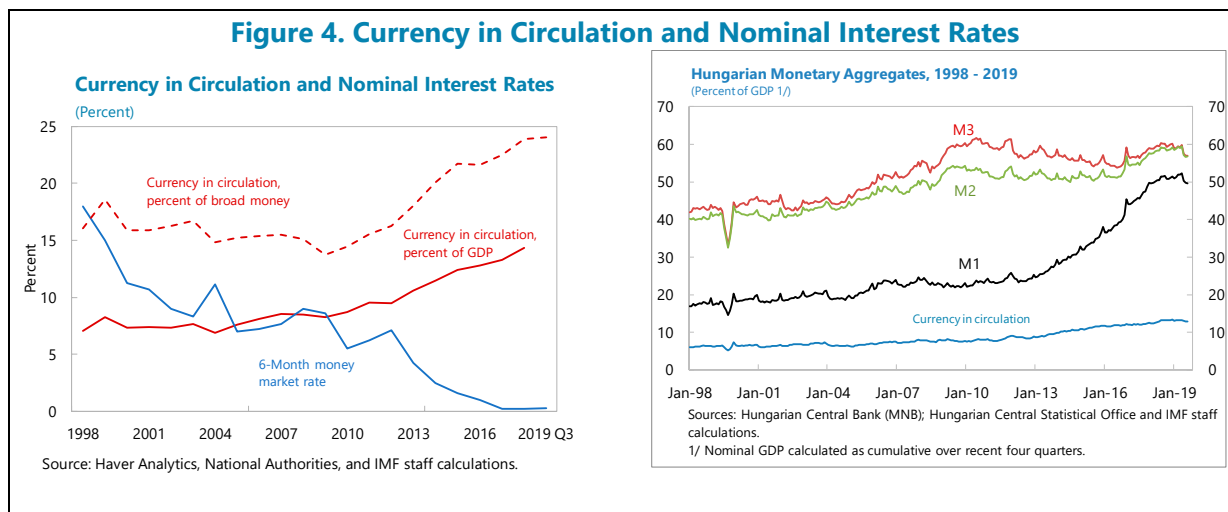
- ***GDP per capita in Euros*** (deflated by Euro Area inflation) has increased by over 50 percent (24 percent) since 2005, while cash in circulation in percent of GDP has almost doubled and cash in Euros per capita has almost tripled. Currency in percent of broad money also appears to be correlated with real GDP growth per capita, particularly after the global financial crisis. However, this may also be caused by lower interest rates and inflation.

Figure 3. Currency in Circulation and GDP per Capita, 1998–2019

Currency in Circulation and Income Per Capita

Currency in Circulation and Real GDP Growth per Capita

Source: Haver Analytics, National Authorities, and IMF staff calculations.

Source: Haver Analytics, National Authorities, and IMF staff calculations.

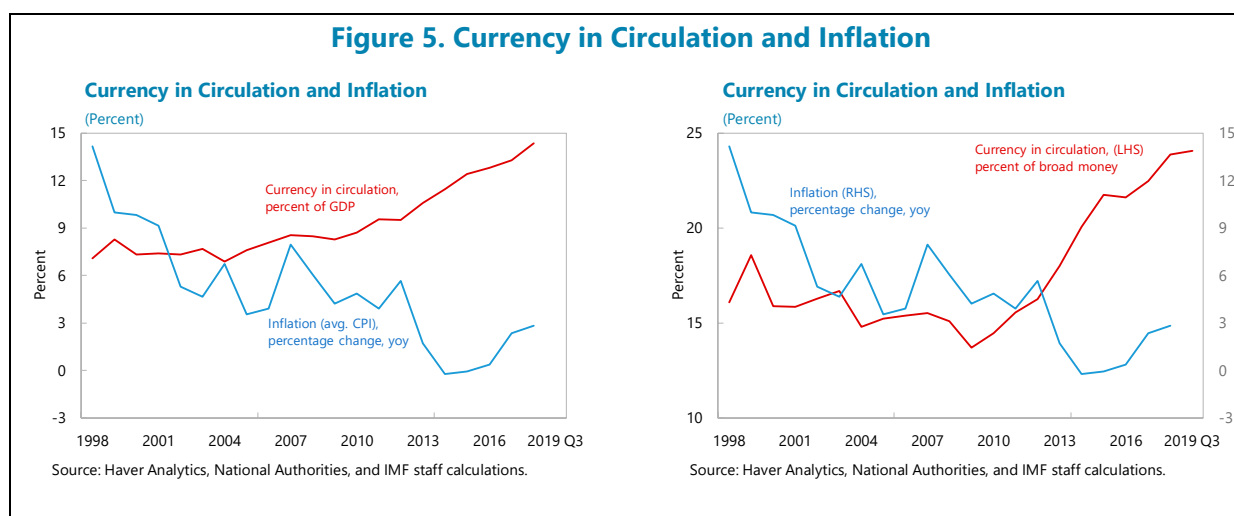- ***Nominal interest rates*** have been declining in Hungary, which has coincided with higher cash holdings. Interest rates declined after the transition to a market economy, as inflation also waned, and again as the recovery following the global financial crises gained traction. The declining interest rates are correlated with larger cash holdings, particularly compared

to broad money. Even more striking is the marked shift from savings deposits to current accounts.
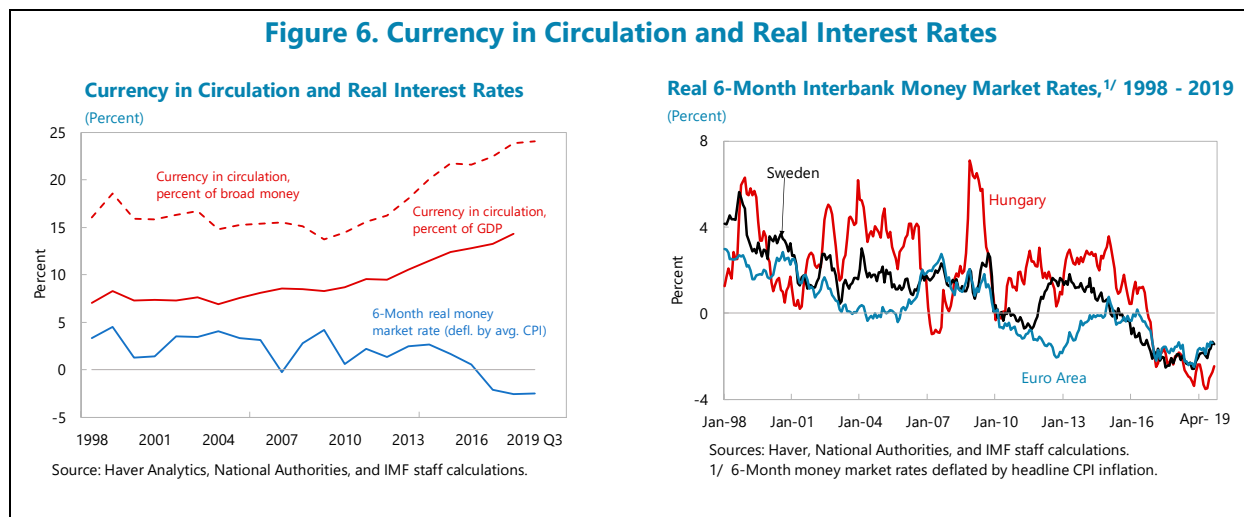
Figure 4. Currency in Circulation and Nominal Interest Rates

Currency in Circulation and Nominal Interest Rates
(Percent)

Source: Haver Analytics, National Authorities, and IMF staff calculations.

Hungarian Monetary Aggregates, 1998 - 2019
(Percent of GDP 1/)

Sources: Hungarian Central Bank (MNB); Hungarian Central Statistical Office and IMF staff calculations.
1/ Nominal GDP calculated as cumulative over recent four quarters.

- **Inflation** has come down, coinciding with increased cash holdings. Inflation declined after the transition and further after the global financial crisis. All other things equal, inflation should have a similar impact on holding cash and bank deposits. However, there is a secondary effect, as more cash is needed in case of very high inflation to conduct a similar amount of real transactions. But this is less important, particularly when prices are broadly stable. More important is the fact that the lower the inflation is, the lower is the opportunity cost of holding cash, hence the stronger the incentive to hold cash, as long as the risk for theft etc. is diminutive.

Figure 5. Currency in Circulation and Inflation

Currency in Circulation and Inflation
(Percent)

Source: Haver Analytics, National Authorities, and IMF staff calculations.

Currency in Circulation and Inflation
(Percent)

Source: Haver Analytics, National Authorities, and IMF staff calculations.

- **Real interest rates** have declined, particularly since 2016, hence enhanced the incentives to hold cash compared to bank deposits. Hungary's real interest rate is currently lower than in Sweden and the Euro Area (EA). While both nominal interest rates and inflation began to decline in 2011, it was only in late 2016 that the real interest became negative. Hence an element of money illusion or other factors could be in play, as cash in circulation began to

accelerate already in late 2012. Around 2016, the growth of cash in circulation appears to have begun to slowly decelerate again. The former coincided with the introduction of the financial transaction tax in 2013, while the latter could reflect recent efforts to reduce the shadow economy.

Figure 6. Currency in Circulation and Real Interest Rates

Source: Haver Analytics, National Authorities, and IMF staff calculations.

Sources: Haver, National Authorities, and IMF staff calculations.
1/ 6-Month money market rates deflated by headline CPI inflation.

Empirical Results

19.   Following the literature, we estimated the impact of traditional factors and policy variables on the demand for cash. Following Jobst and Stix (2017), a generic equation (3) was applied to a small panel of EU countries and then to individual country data. In addition to Hungary, the panel included Bulgaria, Croatia, Poland, Romania, Czech Republic, Sweden, Norway, Denmark, and the UK during the 2000–2018 period. While the results discussed in this note focus on cash holdings per capita, various indicators for cash were used as a robustness check, including currency in circulation deflated by inflation (CPI) per capita, in Euros per capita, in percent of GDP, and in percent of broad money. Different proxies for real income were used: real GDP per capita, GDP per capita in Euros including deflated with EA CPI, and GDP per capita adjusted for purchasing power (PPP adjusted). For nominal interest rates we tried the 6-month money market rate, 5-year government bond rate, and the bank deposit rate. For inflation we used the national consumer price index (CPI). For governance, socio-economic and demographic factors, we tried those indicated in the above Table 1.

$$CurrencyR_{it} = \alpha_0 + \alpha_1 IncomeR_{it} + \alpha_2 Interest_{it} + \alpha_3 Inflation_{it} + \alpha_4 BankCrises_{it}$$
$$+ \; \alpha_5 Corruption_{it} + \alpha_6 Law_{it} + \alpha_7 RegulatoryQ_{it} + \varepsilon_{it}$$

Where $CurrencyR_{it}$ represents a natural logarithm of currency in circulation in per capita terms, $IncomeR_{it}$ is a natural logarithm of per capita real income, $Interest_{it}$ represents interest rate and $Inflation_{it}$ is CPI inflation. A dummy variable indicate a systemic banking crisis is represented by $BankCrises_{it}$. Control of corruption, rule of law and regulatory quality are captured by $Corruption_{it}$, Law_{it} and $RegulatoryQ_{it}$, respectively.

20.   **The standard explanatory variables also worked, as envisaged by the literature, when applied to this set of countries.** Focusing on the fixed effects panel estimates (Table 3), the income elasticity was estimated and, as expected, was positive and significant. The semi interest rate elasticity was negative but not always significant. This is in line with our priors and economic theory. The impact of inflation on cash demand seems ambiguous, as expected: it was not significant and sometimes slightly positive or negative, depending on the specification. The impact of systemic bank crises was small and not statistically significant. Finally, improved rule of law, higher regulatory quality, and better control of corruption seemed to reduce demand for cash. But none of these factors were found to be statistically significant in this panel. We assume that most of the demographic and socio-economic factors are slow moving and thus captured by the fixed effects and hence not investigated further in this paper.

Table 3. Hungary: Panel Regression Results of Currency in Circulation: Fixed Effect 2000–2018

	CurrencyR				
IncomeR	1.69***	1.73***	1.52***	1.51***	1.59***
Interest	-0.02**	-0.02**	0.00	-0.02**	-0.02**
Inflation	0.00**	0.00**	-0.02	-0.02	-0.03*
Bank Crises		0.07	0.03	0.04	0.01
Corruption			-0.18		
Law				-0.12	
RegulatoryQ					-0.47
N	214	214	176	176	176
R2_Adjusted	0.75	0.75	0.75	0.74	0.77

legend: * p<.1; ** p<.05; *** p<.01

CurrencyR	… Natural logarithm of real currency holdings per capita.
IncomeR	… Natural logarithm of real income per capita.
Interest	… Short-term interest rate.
Inflation	… CPI inflation.
BankCrises	… Systematic bank crises.
Corruption	… Control of corruption.
Law	… Rule of law.
RegulatoryQ	… Regulatory quality.

The panel includes Bulgaria, Croatia, Czech Republic, Denmark, Hungary, Norway, Poland, Romania, Sweden, and the UK.

21.   **A similar univariate model was estimated for Hungary.** The estimations suggested that the income effect was strong and positive (Table 4). The impact of the interest rate seemed negative and significant. In contrast to the panel regression results, the impact of inflation was estimated to be slightly positive. The results also suggested a high and significant response of cash demand to the index for control of corruption and a somewhat lower response to changes in the index for the rule of law.

22.   **Demand for cash seemed to be more responsive to changes in income in Hungary after 2012, when allowing for capturing the impact of the financial transaction tax.** Special

attention was given to developments before and after 2012 (the transaction tax was introduced in 2013). For this purpose, we expanded equation (3) by introducing interaction terms between each standard explanatory variable (real GDP per capita, short-term interest rate, and inflation) with a dummy variable identifying years 2013 and beyond. Figure 7 shows: (i) the real currency in circulation per capita; and (ii) the fitted-line based on coefficients only estimated on data from 2000–2012, i.e., before the financial transaction tax. The difference between the two lines is about HUF 100,000 per capita. This appears striking, confirming our hypothesis that the financial transaction tax contributed to a higher use of cash. It also supports our prior that the previously identified structural break coincided with the introduction of the financial transaction tax.

Table 4. Hungary: OLS Regression Results of Currency in Circulation in Hungary, 2000–2018

	CurrencyR
IncomeR	1.13***
Interest	-0.02**
Inflation	0.02**
IncomeR*After_2013_DUMMY	0.02**
Interest*After_2013_DUMMY	-0.01
Inflation*After_2013_DUMMY	-0.02
Corruption	-0.50**
Law	-0.9
N	18
R2_Adjusted	0.98

legend: * p<.1; ** p<.05; *** p<.01

CurrencyR	… Natural logarithm of real currency holdings per capita.
IncomeR	… Natural logarithm of real income per capita.
Interest	… Short-term interest rate.
Inflation	… CPI inflation.
Corruption	… Control of corruption.
Law	… Rule of law.
After_2013_DUMMY	… Dummy variable indicating years 2013 and beyond.

Figure 7. Demand for Real Cash per Capita: Actual vs No Financial Transaction Tax
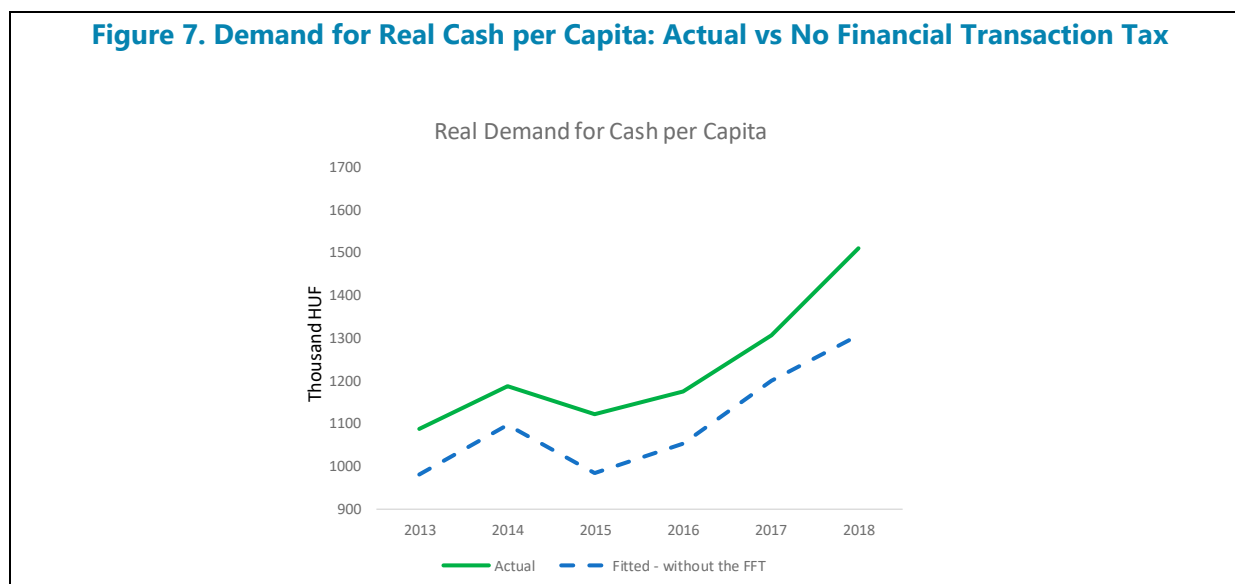
E. Conclusion

23.   The introduction of the financial transaction tax appears to be a prime example of how even a relatively modest change of taxes and incentives can significantly influence behaviors. In addition to the traditional explanatory variable of income per capita, interest rate, and inflation, it seems that the financial transaction tax played a significant role in explaining the increase in cash in circulation. While cash in percent of GDP began to accelerate after the global financial crisis, it really took off around the time of the introduction of the financial transaction tax beginning 2013. Statistically, there is a clear structural break at that time. It looks as if this tax contributed to the increase in the use of cash, at the cost of the generally more efficient non-cash alternatives. In recent years, tax administration has improved, which may help explain why the trend recently has been slowly decelerating.

24.   Experience from other countries suggests that the use of cash is persistent (e.g., Jobst and Stix, 2017; and Bech et al., 2018), despite the development of more efficient alternative payment instruments, unless strong policies to promote non-cash are in place. Widespread use of paper currency may impede the development of financial sector and non-cash payment systems, as it raises the transaction cost of the economy and hinders the efforts to formalize the grey economy. It will be interesting to see how successful the envisaged instant retail payment system will become, given that only transactions below HUF 20,000 are exempted from the financial transaction tax.

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