RELATIONSHIP BETWEEN ELECTRONIC MONEY AND MONETARY POLICY

Senior research fellow Vlastimir Vukovic, PhD,
Institute of Economic Sciences,Belgrade,Serbia
Associate Professor Marko Malovic, PhD,
Institute of Economic Sciences,Belgrade,Serbia

INTRODUCTION

Electronic money – stored value cards, internet-based cash and alike online as well as offline forms, was introduced at the end of the last millennium and immediately became an object of avid research. Right from the start, special attention has been paid to impact of electronic money on central banks and their policy making (BIS 1996).

Palley (2001), for example, announced the e-money revolution in as much as e-money could challenge central bank's ability to control interest rates (through diminishing transactors' demand for central bank liabilities, rendering them unable to conduct OMOs) and also increase financial instability caused by increased elasticity of private money creation. Additional monetary implications urged for safeguarding the unit of account role of national currency, overseeing much quicker and cheaper e-money vehicles for FX-transactions and finally, lurked from the potentially altered information content of monetary aggregates with respect to the e-money penetration (Reynolds and Griffith 2000).

Contrary to high expectations (Woodford 2000), electronic money hasn't claimed super significant share of the world-wide payments system services as yet. Marginal market share caused a decrease in the researchers' interest in the topic too, especially after 2004. Hence the analysis of e-money's impact on monetary policy boiled down to two pages only in the entire special report on innovations in retail payments (BIS 2012). Marginal relevance of e-money is even more evident when confronted with and differentiated from expansion of electronic banking (e-banking). Turning to grass-roots of the e-money/e-banking dichotomy can shed light not only at their likely future development, but also at their impact on monetary policy making. Therefore, it is necessary first to consider both definition and scope of e-money as opposed to e-banking, even more so due to many terminological and material conundrums and imprecisions in regard to the term(s) (Fullenkamp & Nsouli 2004), which further complicate any scientific undertaking in the field.

For monetary policy, the most important are influences of e-money over price stability, i.e. inflation and aggregate demand, and via demand onto GDP. Impact of e-money on price stability will be tested through the analysis of money multiplier, while the aggregate demand effects will be considered through money velocity.

Examination of prudential aspects of e-money and e-banking, such as early risk identification and management, remains out of the scope of this research. The same goes for security hazards of

electronic money, on which topic voluminous literature has been developed (BIS 1996a).

At the end of this chapter, we summed up the main findings of the research and offered estimates of future allies of e-money's development within the ongoing decade.

DEFINITIONS

According to probably eldest and all-encompassing definitions of e-money, it is „an electronic store of monetary value on a technical device that may be widely used for making payments to undertaking other than the issuer without necessarily involving bank accounts in the transaction, but acting as a prepaid bearer instrument"(ECB 1998).

In addition, current judicial definition of in the EU claims that: „electronic money means electronically, including magnetically, stored monetary value as represented by a claim on the issuer which is issued on receipt of funds for the purpose of making payment transaction"(Directive 2009/110/EC).

Key words in both definitions are „electronically stored monetary value". They hint at the prepaid nature of the e-money. After all, first relevant research in this area, published in May 1994, was titled 'Report to the EMI Council on Prepaid cards' (ECB 1998).

Starting premise of monetary authorities suggested that so-defined e-money has "...the potential to challenge the predominant role of cash for making small-value payments and could make retail transaction easier and cheaper for consumers and merchants" (BIS 1996). Robustness of points made

could be verified by utilising cash (currency)/e-money ratio, then e-money/M1 ratio, as well as e-money's share in total retail transactions etc.

Official systematisations differentiate e-money from the so-called access products as well, namely from „payment instruments that allow customers to access their deposit accounts and to transfer the deposit therein" (ECB 1998). Nevertheless, in the very same report payment cards were broken into credit, debit and prepayment cards?!

Be that as it may, couple of years later, ECB includes card-based e-money in cashless payment instruments, also comprising credit/debit cards and alike instruments (ECB 2004). At the same time, credit/debit cards were classified as a basic payment instrument, whereas e-money (inclusive card-based), payment portals and mobile payments (so-called m-payments) belong to a new payment instrument?! Unsustainable logic of such taxonomy was debunked by Fullenkamp & Nsouli (2004). For the sake of the argument, it's sufficient to say that in Japan people use mobile phones with electronic money functionality as par excellence e-money instrument (Bank of Japan 2012).

The essential problem for both monetary policy makers (in terms of regulation and management) and general public (in terms of blurry perception and picking the right instrument) is caused by somewhat artificial wall-divide between the e-money and the e-banking. „E-banking is the use of electronic methods to deliver traditional banking services (taking deposits, making loans, and clearing payments) using

any kind of payment media" (Fullenkamp&Nsouli, 2004). Functionally speaking, there's no difference whatsoever between credit/debit cards and e-money. The only artificially imprinted distinction comes out of the e-money being prepaid payment instrument, although banks too sell their prepaid cards, which formally aren't e-money. Thus, the fact that e-money is emitted by special electronic money institutions doesn't change its true underlying nature. Bottom-line is that debit cards represent a perfect substitute for and superior contestant to the conventional e-money. They utilise the same networks, i.e. access channels (Internet, POS, ATM, Mobilphone), as well as bank-branch infrastructure, give unlimited access to transactional checkable deposits (current accounts), they enable using both depository and credit products of banks, they come cozy for both small-value and middle-value payments, could be bridged with forex accounts, and finally, they appear equally secure and price competitive. Therefore, expansion of debit and credit cards is only understandable, at the expense of direct debits and credit transfers, while e-money's share remains to be measured in tenths of a percentage (ECB 2004).

Due to breaking away from deposit potential (the aforementioned EU's directive prevents electronic money institutions from accepting deposits), the impact of e-money on a money multiplier, and thereby on monetary policy too, appears to be precisely opposite from the effects of debit cards. The impact of e-money pretty much resembles currency impact, which lends support to circulation of the term

electronic cash, accentuating kinship of e-money with more conventional banknotes and coinage.

THE IMPACT ON MONEY MULTIPLIER

Money multiplier (μ), as is well-known, establishes relationship between a monetary base (H), and a money supply (M^S) through equation $M=\mu H$. Monetary base, of course, is made of currency in circulation (*Cash*) and total reserves in a banking sistem (Λ), namely $H = Cash + \Lambda$. Familiar breakdown of total liquidity reserves into required (R^O) plus excess (R^E) reserves and introduction of required reserves ratio $o^R = R^O/D$, excess reserves ratio $e = ER/D$, as well as currency ratio $cash = Cash/D$, yields monetary base as a function of those four variables:

$H = (o^R \times D) + (e^R \times D) + (cash \times D) = (o^R + e^R + cash) D$

By plugging $D = H/(o^R + e^R + cash)$ in the money supply equation $M^S = D + Cash = (1+cash) \times D$, it's easy to arrive at $M^S = [(1+cash)/(o^R + cash + e^R)]H$, with multiplier obviously being $\mu = (1+cash)/(o^R + cash + e^R)$. Now, clearly, central bank predominantly decides the dynamics of required reserves ratio, commercial banks decide on excess reserves ratio, whereas currency ratio gets determined by depositors. It's also readily observable that both the money multiplier and the money supply are negatively related to the currency ratio *cash* (Mishkin, 2006). Put simply, the larger currency quantum in high-powered money, the lower money multiplier would be, and consequently the weaker could be ΔH's impact on M^S.

In addition, introducing e-money (E^M) alters money supply equation in that $M^S = D + Cash + E^M$ (Berentsen,

1997), a curiosity often ignored. By the same token, e-money can be expressed as $E^M = e^M$ x D, where the first right hand-side term is electronic money ratio (Vukovic-Malovic ratio). We further have

$$M^S = D + (cash \text{ x } D) + (e^M \text{ x } D) = (1+cash+e^M) \text{ x } D$$

and in turn monetary base becomes

$$H = (o^R \text{ x } D) + (e^R \text{ x } D) + (cash \text{ x } D) + (e^M \text{ x } D) =$$
$$= (o^R+e^R+cash+e^M) \text{ x } D$$

Mutatis mutandis, it all yields money supply

$$M^S= [(1+cash+e^M)/(o^R+e^R+cash+e^M)] \text{ } H,$$

with multiplier $\mu =(1+cash+e^M)/(o^R+e^R+cash+e^M)$.

Evidently, both money multiplier and money supply are negatively related to the newly introduced electronic money ratio, as in the case of a cash ratio. In other words, rising utilization of e-money decreases money multiplier as well as effectiveness of monetary policy, i.e. its influence over money supply. In fact, there's an intuitive hint for this conclusion, bearing in mind that e-money doesn't participate in multiple deposit creation. Negligible share of e-money in a money multiplier, monetary base and a money supply, corroborates its marginal impact on (effectiveness of) monetary policy as well as on price stability.

Lege artis empirical analysis of the relationship between the e-money and the other remaining segments of a monetary base is thus far not possible, prevented by the fact that monetary statistics in majority of IMF members does not record outstanding value on e-money storages at the end of the year. Based on explosive growth of banks' excess reserves and rising currency in circulation, stems an indirect conclusion that miniscule share of e-money in

monetary base has been additionally dwarfed during still lasting global financial and economic crisis.

Nevertheless, several countries do provide certain data in this regard. Thus in Japan, a country with most developed e-money balances, its share in *M1* at the end of 2011 amounted to 0.026% (in 2007 it was 0.014%). In the same year e-money, in comparison with notes and coins in circulation, took 0.183% (2007- 0.094%), and relative to transferable deposits 0.031% (2007-0.016%). On the other side of the spectrum (from Japan) is Switzerland, where in 2011 E^M/*M1* amounted to 0.003% (2007- 0.011%), E^M/*Cash* was 0.031% (2007- 0.075%), while E^M/transferable deposits yielded 0.005% (2007- 0.02%).

Comparing E^M/transferable deposits ratios from couple of EU countries in 2011 (as opposed to 2007) also reveals negligible and mostly decreasing figures: Belgium 0.047% (0.053%), France 0.008% (0.006%), Germany 0.006% (0.008%), Italy 0.173% (0.053%), and Netherlands 0.000% (0.000%). Relevant data are N/A for Australia, Canada, Sweden, United Kingdom, United States and other CPSS countries (BIS, 2013).

By the way, introduction and usage of e-money in many countries is still not normatively regulated to this very day, hence, it's not even in its 'early days'. Among these, we earmark small open transition economies at the outskirts of the EU (including Serbia). However, all of these countries had quick expansion of e-banking, thanks to which they markedly shortened their lagging behind the OECD counterparts (Vuković 2008).

On the other hand, in the OECD countries, during the global financial crisis, such "(…)massive expansion of base money by central banks was not reflected in the development of broader monetary aggregates because of a collapse of money multiplier when banks were hoarding reserves" (ECB 2010). The second factor has been strengthening of currency ratio *cash*, i.e. strong cash-holding pREFERENCES, characteristic for disinflation and recessional deflation episodes.

Impact on velocity of money

The velocity of money *(V)* represents relationship between nominal income (P x y) and money supply *(M^S)* in classical quantity theory equation: $M^S V = P y$. Therefore, $V = Py/M^S$, by definition (Mishkin, 2006).

That said, one may gather that final effects of lifting or shrinking of M^S on nominal income depend on velocity of money, on which central banks cannot exert direct influence. Bearing in mind that P x y can represent GDP, it's evident what kind of impact money velocity has on aggregate demand. Deceleration of money velocity characterizes recession and depression periods, as in „the unprecedented collapse in the velocity of money from 1929 to 1933" (Friedman & Scwartz, 1993). Troublesome by-product for central bankers, however, is that velocity of money „reflects changes in the public's expectations about the degree of future economic stability" (*Ibidem*).

E-money, as well as e-banking, speeds up money circulation, by simplifying payments and making them more efficient. Nonetheless, efficiency of certain transactions does not automatically imply a growth in

their number or amount, i.e. the equivalent demand hike. In similar fashion, the problem of ongoing double-dip recession does not stem from payment systems' efficiency drop, but from slackening aggregate demand.

Scholarly considerations of influence that money velocity exerts over aggregate demand often times fall prey to misconception that private e-money providers can create „purchasing power outside the monetary system" (Arnone & Bandiera 2004). Electronic money institutions are merely transforming deposits or currency in e-money, nothing more. So, PayPal, for instance, is conducting e-payment services by using government e-money, not private e-money" (Fullenkamp & Nsouli 2004). Even Bitcoin (BTC), a P2P digital currency introduced at the onset of global financial meltdown, owes its popularity to shaken international finance and demand for illicit services (gambling etc.). Bitcoin's volatile market value and still minimal use in trade invoicing makes one hard to convince that dollarisation of an entire country might someday become a matter of mouse clicks, or that information technology could ultimately lead to a pure exchange with real-time open source cryptographic protocol transactions. Furthermore, negligible share of e-money in M^S (i.e. $M1$), illustrated with data for Japan and Switzerland in the previous passage, minimises its impact on velocity of money and, as a corollary, on aggregate demand and GDP. That notwithstanding, bigger share of e-money in wouldn't make much difference, since chief influence

over macro-fundamentals is made by 'public's expectations about economic stability'.

In addition, our finding on negligible importance of e-money for aggregate demand and GDP dynamics could be supplemented by data to do with the value of transactions as a ratio to GDP (BIS, 2013). This ratio for 2011 (as opposed to 2007) was highest in Italy 0.61% (0.22%), then in Japan 0.44% (0.11%), Korea 0.17% (0.11%), Netherlands 0.08% (0.08%), Belgium 0.06% (0.12%), Switzerland 0.01% (0.01%), France 0.01% (0.00%) and Germany 0.00% (0.001%). Similar dynamics could be tracked for the currency areas (e.g. EMU).

Year	EUR million	Growth rate
2006	729	---
2007	683	-6.3
2008	1,177	72.3
2009	1,723	46.4
2010	2,449	42.1
2011	3,087	26.1
2012	4,028	30.5

Table 1. Electronic money issued in the Eurozone
(end of period)
Source: ECB, Monetary Statistics, February 2013.

Growth rates of e-money at the first glance indicate an expansion. Nonetheless, it is no more than a low base effect. Unbiased estimate could be made only after comparison with respective monetary aggregates for EMU as a whole. These are, foremost, money supply (*M1*), currency in circulation (*Cash*) and overnight (transferable) deposits (*D*). Hence, we continue by

presented a table with indicators produced out of ECB Monetary Statistics data.

Year	$E^M/M1$	$E^M/Cash$	E^M/D
2006	0.020	0.126	0.023
2007	0.018	0.109	0.021
2008	0.030	0.166	0.036
2009	0.038	0.228	0.046
2010	0.052	0.310	0.062
2011	0.064	0.366	0.078
2012	0.079	0.467	0.095

Table 2. Relative share of e-money in the Eurozone (%)
Source: ECB, Monetary Statistics, February 2013.

Fast growth of e-money in the Eurozone is confirmed by all the indicators shown. Index in 2012/2006 for the first indicator yields 395, for the second 371 and the third 413. Nonetheless, share of e-money in *M1* still hasn't reached 0.1%, nor it succeeded in visibly suppressing the currency in circulation, from which it remains more than 200 times smaller. Having said that, it's important to bear in mind that Eurozone stands second only to Japan in terms of e-money development, in other words far ahead of the US and many other post-industrial countries.

OTHER INDICATORS

Official monetary statistics, as already pointed out, keeps fragmentary, incomplete record of e-money development. Especially missed are the data of interest for monetary policy making, such as

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outstanding value on e-money storages at year-end. Naturally, this is not to say that corresponding amount, how ever small, isn't encompassed by *H* and *M1*, yet it isn't identified separately.

On the other hand, there is bunch of data on use of e-money products – name of system, number of issuers and card issued number of merchant terminals, volume and value of daily (purchase) transactions – which are less significant or quite irrelevant for monetary policy (BIS 2004).

According to total number of transactions one could infer that usage of e-money proves to be highly volatile from country to country, so that Index 2011/2007 amounts 56.2 for Belgium, 176.1 for France, Germany 69.5, Italy 306.3, Japan 289.3, Korea 76.9, Netherlands 101.2 and Switzerland 59.9 (BIS 2013). Proper explanation of fairly dramatic fall in the number of e-money transactions in Belgium and Switzerland and the notable drop of respectful figures in Germany and Korea would require separate research, in as much as obvious divergence between them and the number of transactions in Japan, Italy and France persists.

To sum it up, e-money payment transactions as a rule of thumb capture rather small shareof total number of payment transactions, as evident in statistics for 2011 (2007): Belgium 2.0% (4.3%), France 0.3% (0.2%), Germany 0.2% (0.3%), Italy 3.9% (1.5%), Korea 0.8% (1.7%), Netherlands 3.1% (3.9%) and Switzerland 0.7% (1.5%). Respectable share of e-money- in total payments has been achieved in Japan only: 11% in

2007 and 13.5% in 2009, whereas for later years data aren't available (BIS 2013).

Important indicator of e-money penetration is described by the number of transactions per inhabitant (total for the year). Comparative analysis of data for 2011 (vis-à-vis 2007) confirms leadership position of Japan with 18.3 (6.3), za kojim followed by Netherlands with 10.6 (10.7), while other countries markedly lag behind: Belgium 4.6 (8.5), Italy 2.5 (0.8), Korea 2.3 (3.0), Switzerland 1.3 (2.3), France 0.7 (0.4), and Germany 0.4 (0.6).

Exhibited indicators suggest three crucial points: first, that e-money is underdeveloped in the whole world apart from Japan, second, that quicker and even reasonably impressive growth of e-money in certain areas like the Eurozone for example still hasn't resulted in its more significant share (like above 1% at least), and third, that already negligible importance of e-money further falls in many countries.

Global financial crisis undoubtedly brought about additional volatility in anyway minimal utilisation of e-money, and yet decisive causes of its underdevelopment should be traced to competitive relationship with much superior and widespread payments (debit and credit) cards.

Therefore, expansion of payments cards has been steadily shifting the interest of monetary policy from e-money onto e-banking. But that doesn't mean that regulating release of e-money, i.e. taking up, pursuit and prudential supervision of business of electronic money printing institutions is entirely neglected. Example of the EU, which adopted the second

directive for regulation of such business models back in 2009, reconfirms still flickering interest of monetary authorities in e-money.

CONCLUDING REMARKS

Electronic money still hasn't acquired crucial enough importance for monetary policy, as measured by its minute share in monetary base and money supply (being below 0.1%). Other indicators simply corroborate this finding. Japan and a few Eurozone members prove to be something of an outlier, as above average holders&issuers of e-money. Simultaneously, already miniscule share of e-money in countries like Germany and Switzerland is further decreasing.

Such diverging trends question the very functionality and competitiveness of e-money as a medium. Debit cards prompted themselves as a perfect substitute for and in fact superior contestant to e-money. Focus on small-value payments doesn't provide e-money with competitive advantage over cash, which is network-independent and available at each and every ATM. Between the alternatives, majority of consumers evidently chooses debit and credit cards or cash, at the expense of prepaid e-money and on-line currency. Hence the future of e-money doesn't appear to be so bright as prophesied 10 or 15 years ago.

Key fact for monetary policy making is that such e-money keeps out of deposit multiplication, thereby producing the same effect on money multiplier as the currency in circulation. Moreover, positive impact of e-money on money velocity doesn't bear relevance for aggregate demand. Once you add to the big picture literally negligible share of this money in total payment transactions and monetary aggregates, it becomes patently clear that e-money simply cannot and won't have an impact anywhere near significance

in regard to (inter)national monetary policy in the foreseeable future.

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