

## (Real-)Time Is Money

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In the age of high-frequency trading in financial markets and faster payment services in account-to-account (A2A) transactions of bank retail customers, it may seem odd that the shortest maturity that is traded in the money market is overnight. This situation reflects policies implemented by central banks, which provide banks with free intraday liquidity. Such policies are difficult to ground in theory and have limitations which central banks could remedy by conducting real-time monetary policies. The article details how, following that decision, central banks could adapt some features of their monetary policy operational frameworks and of their real-time gross settlement systems. In any case, the potential benefits of such a move should be carefully weighed against the costs for the central banks, financial intermediaries and society.

**Keywords:** Intraday liquidity, Real-time gross settlement systems, Monetary policy, Financial stability

**JEL classification:** E40 E52 E58 G12 G21.

## Le temps (réel), c'est de l'argent

À l'âge du trading haute fréquence sur les marchés financiers et de la mise en place de services de paiements instantanés dans le commerce de détail, on peut trouver étrange que l'échéance la plus courte négociée sur le marché monétaire soit le jour le jour. Cette situation est le reflet de politiques menées par les banques centrales qui fournissent gratuitement la liquidité intrajournalière au système bancaire. De telles politiques sont difficiles à fonder en théorie et comportent des limites auxquelles les banques centrales pourraient remédier en conduisant des politiques monétaires en temps réel. L'article détaille comment, à la suite de cette décision, les banques centrales pourraient adapter certaines caractéristiques de leur cadre opérationnel de politique monétaire et de leurs systèmes de règlement brut en temps réel. En tout état de cause, les avantages potentiels d'un tel choix devraient être soigneusement pesés contre ses coûts pour les banques centrales, les intermédiaires financiers et la société.

**Mots-clés :** Liquidité intrajournalière, Systèmes de règlement brut en temps réel, Politique monétaire, Stabilité financière.

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## Introduction

In the age of high-frequency trading in financial markets and faster payment services in account-to-account (A2A) transactions of bank retail customers, it may seem odd that the shortest maturity that is traded in the money market is overnight. This paper highlights that this situation is the result of policies implemented by central banks which aim at preventing the development of an intraday money market, through the provision of free intraday liquidity, showing that such policies create a mirage (1). It then proposes real-time monetary policy as a possible alternative (2). It finally draws conclusions (3).

### 1. Free intraday liquidity is a mirage

I first highlight the theoretical rationale for providing seemingly free intraday liquidity (1.1), then how this policy is implemented (1.2) and finally its drawbacks (1.3).

#### 1.1 Theoretical rationale

Two main reasons for providing free intraday liquidity are mentioned in the literature:

- Intraday liquidity is used only for transaction purposes, not for consumption or production purposes, because there is supposedly no need to optimize the timing of consumption or production over the course of a single day. Furthermore, the central bank has the capacity to create money at zero cost and, according to the Friedman rule (Friedman, 1969), the opportunity cost of holding money should equal the social cost of creating it. So it is socially optimal to provide free intraday liquidity (Zhou, 2000; Martin, 2004; Bhattacharya J. *et al.*, 2009; Martin and McAndrews, 2008, 2010). In fact, this line of argument does not allow understanding, for instance, why intraday trading and high-frequency trading exist in the first course, and why there is a demand for them (admittedly, it is true that high frequency has developed more recently than the works quoted but intraday trading has been around for much longer);
- Costly intraday liquidity would give incentives to banks to delay sending payments, thus creating a negative externality, with a risk of gridlock in payment systems (Angelini, 1998, 2000). In fact, intraday liquidity is costly to acquire, even though it is seemingly provided freely by central banks (1.2).

#### 1.2 Implementation

Central banks theoretically have the capacity to implement the socially optimal solution by providing free intraday liquidity in the real-time gross settlement (RTGS) systems they operate, in the sense that the interest rate which they set on this liquidity is nil. This *de facto* (intraday) standing facility makes intraday transactions profitless: no private agent is in a position to provide or get intraday liquidity at better conditions than those offered by the central bank, which presents no risk. One consequence is to create a discontinuity between intraday liquidity, the provision of which is part of payments policy, and overnight liquidity, the provision of which is part of monetary policy, with an operational target in most cases on the unsecured overnight rate in the interbank market. In other words, on the yield curve, the objective is that the part of the curve which corresponds to maturities between 0 and the closing of the money market would be flat at zero. To cover possible overdrafts on their accounts at the end of the day, banks must thus be able to access some end-of-

day standing facility (*e.g.* discount window in the Federal Reserve System and marginal lending facility in the Eurosystem) which is also used to provide a ceiling to overnight rates.

However, for statutory reasons and in order to limit both moral hazard and their own risk exposures, central banks require intraday lending to be collateralized (Martin, 2004), as is also the case for overnight or longer maturity central bank lending. This makes intraday liquidity costly (1.3).

### 1.3 Drawbacks

The free intraday liquidity policy has some limitations:

- In contrast with the stated objective of making intraday liquidity free, the empirical literature shows that there is an implicit intraday money market. This market takes the form of a declining pattern of overnight interest rates over the course of the day, with estimates of the implicit intraday interest rate varying in normal circumstances between 0.1 bp (Jurgilas and Žikeš, 2012) or 0.2 bp (Baglioni and Monticini, 2008) to 0.9 bp (Furfine, 2001), perhaps reflecting different institutional settings. One reason for this declining pattern is that pledging collateral is costly, a specific consequence being that the cost of intraday liquidity raises in times of financial crises, when the demand for collateral increases (Baglioni and Monticini, 2008, 2013; Kraenzlin and Nellen, 2010). Furthermore, Abbassi *et al.* (2017) show that, even in a liquid and secured market as the euro repurchase market, there is an implicit intraday interest rate during periods of stress, with rates 5 basis points lower in the afternoon than in the morning during the financial crisis and the sovereign debt crisis. They attribute this positive intraday interest rate to a remaining liquidity risk during crisis periods, which the “free” provision of intraday liquidity by the central bank does not eliminate;
- As they have to collateralize their intraday deficits, banks make the bulk of their payments late in the day (Angelini, 1998; Jurgilas and Žikeš, 2012). This shows that the free intraday liquidity policy cannot properly accommodate the second theoretical reason for its adoption mentioned above (1.1). Sending payments late in the day also *de facto* transforms RTGS systems into differed time settlement systems, making one drawback of those systems (*i.e.* allowing daylight credit risk) reappear. In other words, the seemingly free intraday policy of central banks is at odds with their efforts to increase the security of payments systems through the promotion of RTGS systems.

The free provision of intraday liquidity is also not in line with current changes in payment practices:

- Whereas it currently takes up to one business day for a payment in euro to reach the beneficiary in the same euro area country, there is a demand from producers for timely execution of some payments, in order to improve the efficiency of the supply chain and reduce the working capital of intermediaries (Manson, 2017). There is also an at least implicit demand for such payment services from consumers, as they expect all their liquid assets to be available on demand, without any lag, need for notice or amount limitations (Chanavas, 2017). More generally, in digitalized economies, immediacy is easily taken for granted. As a consequence, instant (also called “real-time” or “fast”) payments solutions, where instant certainty of the payment both to the payer and the payee is given, have been developed in the past 15 years, with the aim to ensure the continuous ability to send and receive payments at any time any given day. According to Bech *et al.* (2017), at the end of 2016, there were 20 fast payment systems in operation in the world, covering more than

40% of the world's population and their diffusion is similar to the one of RTGS systems 20 years before (at the end of 2016, according to the authors, RTGS systems were operated in nearly all advanced economies and in three quarters of the emerging economies). However, such fast systems currently exist only in a few euro area countries. Accordingly, in a speech discussing the digital transformation of the retail payments ecosystem, Mersch (2017) is of the view that “over time, the banking ecosystem [of the euro area] has developed inefficiencies. It has lost some ability to innovate and adapt to the changing needs of the end-user” whereas “the ability to provide real-time services will be essential if banks want to retain and gain customers”. To facilitate the full roll-out of instant payments across Europe, the Eurosystem has decided to launch, within its RTGS system TARGET2, an instant payments settlement system in central bank money, the Target Instant Payment Settlement (TIPS) Service. The new service will operate on a 24/7/365 basis and be offered at the price of a maximum of 0.20 eurocent per payment for at least the first two years of operation, with the entry and maintenance fees for an account in TIPS being set at zero, while allowing full price recovery by the Eurosystem. It is scheduled to go live in November 2018. In the meantime, euro area banks are expected to update their software, operating procedures and supply of services to their customers;

- In many financial markets, day trading and high frequency trading currently represent a large share – probably the majority – of transactions. This seems to be the case especially foreign exchange, interest rate and stock markets. There is no clear reason why such activities should get the basic commodity they operate with – liquidity – at no cost. Furthermore, free intraday liquidity creates a distortion in favor of those activities vis-à-vis overnight transactions, which also does not seem warranted. Finally, a new generation of payment systems could develop in financial markets in the coming years, with the use of the distributed ledger technology (DLT), especially as regards settlement of securities and cross-border payments, which would also be carried out in real-time (2.3; Bech *et al.*, 2017; Pfister, 2017).

Social welfare and level-playing field considerations would thus suggest discontinuing the “free” intraday liquidity policy, provided that the costs of the alternative policy do not exceed those implied by the current one.

## **2. Real-time monetary policy as a possible alternative**

Being able to contract at precise maturities in the day presupposes that the current discontinuity between intraday and overnight maturities is abolished and thus that a real-time monetary policy is put into place, in order to keep only one yield curve for a given issuer, covering then both intraday and longer maturities. I first draw the consequences of such a change for financial intermediaries, in particular banks (2.1), and then for central banks' monetary policy operational frameworks (2.2) as well as financial stability missions, especially as providers of RTGS systems (2.3).

### **2.1 Consequences for financial intermediaries**

Banks' positions on their central bank accounts would have to be computed and remunerated on a real-time basis at monetary policy rates (the shortest time lapse that would be considered would have to be defined). As a result of the remuneration of central bank accounts on a real-time basis, money markets would move to precise time transactions, and intraday transactions would become part of the money markets. This would greatly reduce incentives to delay sending payments and the corresponding externality in settlement systems (1.3). Even though a new faster payment system

would probably work at all times of the day and year (Rysman and Schuh, 2016; Mersch, 2017, for the euro area), especially if it has to settle international payments (2.3), money and other financial markets opening hours might remain unchanged. However, keeping financial markets opening hours unchanged while moving to a real-time monetary policy would create a somewhat awkward situation where transactions could be unwound (to the extent that the payment system allows it) but not initiated during “night” hours.

The costs for financial intermediaries of adapting to a real-time monetary policy would be of three sorts:

- They would have to make a one-time investment to adapt their infrastructure in order to make real-time transactions with the central bank and on financial markets;
- They would also probably have to hire additional staff to implement and monitor their payment and settlement operations, especially if financial markets working hours are extended;
- As they would have to borrow intraday liquidity at a cost (on top of having to provide collateral), their net interest payments they would be paid on their reserves would be lower.

On the other hand, banks would be in a better position to offer their customers timely payment services and price them in a more transparent manner. They may also wish to manage the account balances of their customers, or at least some of them, on a real-time basis (this is already the case for payment institutions, since they are not allowed to grant overdrafts; Calmo, 2017). In fact, it is likely that, in order to save liquidity, banks’ large customers, such as multinational firms, would wish to manage their accounts with banks on a real-time basis (1.3), especially if they could do so at a global level (2.3). In that regard, whereas transfers within the U.K. Fast Payment System (FPS) were limited to £10,000 at the inception of the system in 2008, the limit was raised to £100,000 for business customers (Greene *et al.*, 2015). Indeed, there is no clear reason, from a theoretical point of view, to limit the amounts that can be transferred, provided that any credit risk involved is appropriately managed. From a practical point of view, one reason why the diffusion of fast payment systems is as fast in emerging economies as in advanced economies, whereas it was slower for RTGS systems, may be that investments made in payments infrastructures and which would become obsolete with the adoption of fast payment systems, are more important in the advanced economies (Bech *et al.*, 2017). However, this obstacle may slow the process of coordination and collective decision-making between payment service providers but seems unlikely to obviate it, if only because competitors can enter the payment services market.

## 2.2 Consequences for central banks’ monetary policy operational frameworks

Open market operations could be maintained essentially in the current format (duration, frequency, time schedule...), except that the details of the procedures to implement those operations would have to be followed by the central bank and its counterparties with extreme time precision. However, central banks would have to consider two related adjustments regarding their monetary policy operational framework (Drumetz *et al.*, 2015): whether to change their operational target and how to smooth short-term money market rates.

Regarding the operational target, the overnight interest rate would not exist anymore as such, in its current fuzzy definition allowing repayment at any time in the next day, and would instead in principle become just one maturity in an extended yield curve. However, institutional factors, for

instance the use of the overnight rate – henceforth understood at the 24 hour rate – as a reference in financial contracts, may continue to give prominence to that specific maturity. In particular, having an objective on the 24 hour maturity might fit well with market practices: Jurgilas and Žikeš (2012) find that the distribution of overnight loan duration in the United Kingdom’s large-value payment systems (CHAPS) currently exhibits two modes, with one at around 19 hours and the other one at 24 hours. Nonetheless, market practices might well change with the move to real-time monetary policy. On the one hand, this move would encourage the conduct of transactions at more diverse, idiosyncratic maturities, and the 24 hour maturity would then be deprived of specificity. On the other hand, real-time monetary policy might appear as a “regime shift” (Lucas, 1976), thus making any expectation of economic agents’ reactions to its occurrence uncertain, although the change would have to be communicated well in advance, so that private agents and in particular financial intermediaries (2.1) can get prepared. In fact, a solution for those central banks, in particular those which operate a “corridor system”, could simply be to abandon their current implicit – in the case of the ECB – or explicit – in the case of the Fed – target on the overnight rate and not to replace it. In order to limit possible volatility on the money market, this change could itself be announced ahead of the adoption of the real-time monetary policy. The central bank would then signal the monetary policy stance just by setting the interest rate in its open market operations and standing facilities (marginal lending and deposit facilities for the ECB, rate of remuneration of reserves and discount rate for the Fed).

As a result of the pricing of intraday liquidity at or close to the main monetary policy rate, banks should contract at precise times in the day (2.1) and their treasury transactions would likely be spread more evenly than nowadays during the entire day. As a consequence, the risk of the adoption of a real-time monetary policy leading to more interest rate volatility can be downplayed, at least in normal circumstances. However, in periods of financial crisis, central banks might have to act as lenders of last resort also at intraday maturities. Furthermore, even in normal circumstances, there might be a risk that volatility at intraday maturities is transmitted along the yield curve to longer maturities which are more important for the financing of the economy, thus creating “noise” in the monetary transmission mechanism and justifying a smoothing of short-term money market rates by the central bank. Such a risk might in particular materialize at the inception of the real-time monetary policy, as a consequence of the “regime shift” referred to above. Apart from the conduct of open market operations, the smoothing of short-term money market rates is usually achieved through the imposition of reserve requirements and the operation of an interest rate corridor (Drumetz *et al.*, 2015):

- It is unlikely that required reserves, which are based on short-term deposits of non-financial agents with the banks, could be set at levels which could comfortably absorb the large flows resulting from the functioning of financial markets without imposing excessive strains on banks’ balance sheets. Furthermore, this would not help financial institutions which keep an account at the central bank but do not collect deposits from the public and thus are not submitted to reserve requirements. More generally, it would be rather paradoxical if the central bank did not rely on the money market, as it usually does, to allocate appropriately central bank liquidity. Rather than increasing the size of its balance sheet, the central bank would thus incentivize holders of the monetary base to increase its velocity by transacting in the intraday market;
- In fact, whereas the reserves which the central bank remunerates are currently those held at the end of the day, thus overnight, the very decision by which central banks could introduce a real-time monetary policy would simply be to wave any time reference for the

remuneration of deposits made at the central bank, be they required or excess reserves, and just set a minimum duration for those deposits at a very low level, *e.g.* a second or less, for them to be remunerated. The rate of remuneration would be the deposit facility rate for excess reserves held with the Eurosystem (required reserves are remunerated by the Eurosystem at the rate of its main refinancing operations – *i.e.* its open market transactions) or the rate of remuneration of reserves by the Fed. The same approach could be implemented regarding the facilities that provide a ceiling to short-term interest rates, *i.e.* the marginal lending facility operated by the ECB, and the discount facility operated by the Fed, although the latter one is seldom used due to the “stigma” effect attached to it. By granting intraday loans at their respective rates, both facilities would put a ceiling to intraday interest rates. In sum, instead of computing positions on the basis of snapshots at the end of the day, the central bank would reckon all its transactions with its monetary policy counterparts – *i.e.* basically the banks – on a real-time basis. Furthermore, particularly at the inception of the real-time monetary policy, it could be useful to reduce the width of the interest rate corridor and or to conduct “fine tuning” operations (*i.e.* open market operations which do not pertain to a pre-announced schedule), in order to reduce the volatility of the very short-term interest rates.

### 2.3 Potential consequences for central banks’ financial stability missions

Real-time can also have consequences for central banks’ tasks in the field of financial stability, and more particularly for the management of the RTGS systems they operate. Two examples of where such consequences arise can be given, with a possible answer being in each case an extension of the systems opening hours.

The first example relates to TIPS (1.3). When TIPS goes live in 2018, the operating hours of TARGET2 will remain the same as today, so this will limit the times in which the TIPS accounts can be funded/defunded (ECB, 2017). As a consequence, a split of liquidity between TIPS and other payment solutions will be created. Such a split entails by nature a loss of efficiency, in comparison with a situation where banks and other providers of payment services would maintain only one pool of liquidity (or more exactly two pools of liquidity which are fungible because liquidity can be easily and instantly transferred from one to the other). More importantly, while this inefficiency would not matter much in normal situations, where banks can extend credit to each other and liquidity is abundant, it might become more problematic in crisis situations, where liquidity gets scarce. However, the ECB has stated that it would assess whether to extend the availability of the TARGET2 accounts (ECB, 2017). Another possibility, provided that the technology makes sufficient progress, would be to have recourse to a DLT platform (1.3) in the place of the central bank’s RTGS system, outside of its opening hours, as simulated in the Project Ubin of the Monetary Authority of Singapore (MAS, 2017). As explained by Bech and Garratt (2017), this project uses a digital depository receipt (DDR) approach (a DDR is a claim on central bank reserves held in a segregated account against which the central bank issues digital tokens on the DL). In the Project Ubin, banks acquire or redeem digital tokens at any point during the day and can keep them on the DL overnight. However, the amount of tokens at the disposal of participants in the DL remains limited *ex ante* by the deposits made on the segregated accounts before the central bank closes, which might entail a gridlock of the DLT platform in case liquidity needs within it would rise in an unexpected manner.

The second example relates to the settlement of international transactions. Indeed, the tendency towards faster payments is also observable at the global level. Until recently, when the processing

capacities of their distributed ledgers became congested by the increase in number of transactions, crypto-assets have allowed making cheap and speedy payments at the global level, notably for the sending of remittances (Pfister, 2017). In the perhaps not so distant future, adherence to an international standard, such as ISO 20022, could also permit faster payments between countries (Greene *et al.*, 2016). More importantly, if those central banks issuing major currencies moved to real-time monetary policy, time zone differences for transactions in these currencies could be abolished. For instance, the Continuous Linked Settlement (CLS) system, which is used to settle a large part of international payments, especially those resulting from foreign exchange transactions, could become a real-time system backed by the RTGS systems of central banks issuing the currencies cleared and settled in CLS, possibly using the DLT. Alternatively, international banks could settle directly in the national RTGS systems of the currencies transacted, through their local subsidiaries. In both cases, RTGS systems would then have to be accessible permanently. This arrangement would allow much more rapid settlement and eliminate both:

- A residual risk in CLS resulting from the possibility for participants to benefit from a netting effect on the funding of their positions (currently, overdrafts in individual currencies are permitted to the extent that the net position across all currencies remains positive, which creates a currency risk within CLS; Kahn and Roberds, 2001; ECB, 2001);
- The subsequent need of the CLS system for liquidity providers.

However, changing CLS into a real-time system would also entail costs such as shift working in banks and central banks.

### 3. Conclusions

Free intraday liquidity does not appear able to solve the difficulties it is supposed to address, such as avoiding that agents value the timely execution of payments or that banks delay sending payments feeding RTGS systems. By conducting real-time monetary policies, central banks could better take reality into account: intraday liquidity is in fact costly and there is a demand for the timely execution of payments. Central banks would also take a step towards more complete markets, extending the yield curve to maturities shorter than overnight and multiplying the maturities at which agents could contract. They would make it easier for banks to respond a demand from consumers and producers, suppress a bias in favor of day and high frequency trading, and avoid having the RTGS systems they operate be used as *de facto* differed payment systems. This could be done relatively simply by the central bank holding all its counterparties' accounts on a real-time basis. However, before a move to real-time monetary policy is decided, central banks could envisage how to possibly adapt some features of their monetary policy frameworks, such as their operational target or how they smooth short-term interest rates, and of their RTGS systems, such as opening hours. They should also communicate well in advance of this move, so that private agents, and in particular banks, can get prepared. Overall, the costs for the central banks, financial intermediaries and society should be carefully weighed against the potential benefits.

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