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The two-tier system in transition: public foundations, private innovation

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The digital transformation has reopened a very old question: how should public and private money coexist?

The two-tier monetary system is not a legacy institutional arrangement that technology will make obsolete. It addresses a recurring design problem: how to preserve trust by combining a public monetary anchor with private intermediation and innovation.² Digitalization is changing the instruments, infrastructures, institutions, and business models through which money and financial services are provided. The key question is which aspects of the current architecture should be preserved, and which can safely evolve in a changing ecosystem.

My argument is that the logic of the two-tier system remains relevant, even as its institutional and technological setup evolves.

Today, I will discuss why the public-private division of labor remains relevant in a digital economy and look at how it is evolving in retail and wholesale finance. I will then focus on the strategic implications for banks and on why uncertainty calls for flexibility, experimentation and staged investment.

The foundation of the two-tier system and the division of labor

Money works because users can normally accept it without having to assess the issuer's creditworthiness.³ Bank money can do this because regulation, supervision, liquidity

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² On the architecture of the two-tier system and the complementary roles of central bank and private money, see BIS (2026, Ch. III). On the need to modernize both central bank money and commercial bank money to preserve stability and trust in a digital financial system, see also Panetta (2026a).

³ Money-like claims can circulate without continuous assessment of the issuer when their value is sufficiently insensitive to private information; see Gorton and Pennacchi (1990), Holmström (2015), Dang, Gorton and Holmström (2020) and Gorton (2017).

backstops, deposit insurance, and the payment and settlement architecture support convertibility at par across issuers.⁴ This allows different forms of money denominated in the same currency to be used at the same face value, which is what we call the singleness of money.

Digitalization changes the technology, but the underlying design problem remains.⁵ Programmable ledgers, tokenization and instant transfers can reduce frictions and make payments and financial transactions faster. Yet, these technologies create value only within an architecture that preserves trust, convertibility, liquidity efficiency and settlement finality.

At the heart of this design is the public-private division of labor. Central banks provide the monetary anchor: they supply retail and wholesale public money and promote the standards, infrastructures, and safeguards within which private innovation can develop.⁶ Commercial banks, payment service providers, and other financial institutions bring customer knowledge, technological expertise and the ability to develop services and products. Commercial banks also play a distinctive role in creating money through lending, assessing and bearing credit risk, and providing balance-sheet capacity and liquidity.

The question is how this division evolves as payments become increasingly digital and financial instruments increasingly tokenized.

In retail payments, cash has long provided households and firms with a public outside option. Its value goes beyond how often it is used: the very availability of cash supports confidence in convertibility, limits market power, and provides a safe reference point in stress.⁷ As payments shift to digital, cash alone cannot provide that outside option everywhere, and a retail central bank digital currency (CBDC) can extend that role.⁸ In this model, central banks provide the public monetary asset and the common infrastructure; supervised intermediaries distribute it, manage customer relationships and compete on front-end services. The objective is to keep public money sufficiently usable to remain a credible anchor, while preserving space for private intermediation and innovation.

In wholesale markets, reserves are already digital. But if financial market instruments, collateral and contractual instructions move onto DLT platforms, wholesale central bank

⁴ See CPSS (2003), Bindseil (2004) and BIS (2026, Ch. III).

⁵ See Ryu, Shin, Sung and Yun (2026) on the Bank of Korea's Project Hangang.

⁶ On central banks acting as providers of the settlement asset, operators, overseers and catalysts in payment systems, see CPSS (2003, 2005) and Padoa-Schioppa (2004). On the importance of common standards and public-private cooperation in developing safe and interoperable payment systems, see also Panetta (2026b).

⁷ Armelius, Claussen and Hendry (2020) discuss a potential confidence mechanism arising from the ability to convert deposits into cash or CBDC.

⁸ In the euro area, the outside-option argument complements the other motivations for the digital euro: freedom of choice, inclusion, resilience and European autonomy in a strategic sector (Scotti, 2025b, 2026). On the digital euro's contribution to payment resilience and European strategic autonomy, and its role in supporting private innovation, see also Cipollone (2026a).

money may need to be available in new forms and environments. Different settlement assets may coexist and serve different use cases. If central bank money were not available in the relevant environment, greater reliance would fall on private settlement assets. These can play useful roles, but they also bring the credit, liquidity, and, potentially, the concentration risk of the issuer into the settlement process. If private money were to become the main settlement medium for wholesale financial transactions, we would go back to a pre-RTGS world. The key challenge is therefore to preserve access to a risk-free settlement asset while ensuring interoperability across platforms, so that liquidity does not fragment and settlement finality is not weakened.

From principles to practice

These principles do not determine how the market will evolve through the digital transition. That will depend on the choices of banks and other market participants: the services they develop, the use cases they pursue, the infrastructures they invest in, and the standards and business models around which they coordinate.

Tokenization therefore reaches beyond payment specialists, IT departments or innovation labs, raising broader questions of business strategy and market structure.

Timing matters as well. At this stage, the future architecture is still open: standards are being defined, market positions are not yet entrenched, and several different frameworks remain possible. This creates uncertainty, but also scope for experimentation, learning, and influence.

Two possible outcomes

Tokenization holds the potential to integrate functions that are currently spread across issuance, trading, settlement, custody, servicing, standards and collateral management. Common networks and smart contracts may shorten transaction chains, reduce reconciliation and make financial services more programmable. Whether these gains materialize depends on how the market is organized.

If tokenization gains scale, one possible outcome is an interoperable ecosystem in which common standards allow money, assets, and services to operate across platforms and in which competition takes place based on quality, price and innovation rather than through control of closed networks.

At the other end of the spectrum lies a scenario with a multitude of non-interoperable proprietary platforms, each with its own standards, operating models, and settlement arrangements. Such platforms may foster experimentation and innovation, but, without interoperability, diversity can turn into fragmentation, with assets, liquidity, and connections dispersed across siloed platforms. Transactions may become faster within individual networks, while the market fragments.

Private incentives may make this second outcome more likely. Each firm has an incentive to solve its immediate problems, while none has sufficient incentives to bear the full cost

of open standards and common solutions.⁹ Network effects can entrench early proprietary choices and dependence on a small number of platform operators, technology providers or interoperability mechanisms, reducing contestability and limiting the ability of other participants to influence how the market evolves.¹⁰ These risks can be particularly significant for smaller institutions, which have less bargaining power and fewer resources to maintain multiple connections.

Interoperability and common standards have some of the characteristics of public goods: they may be underprovided by individual firms even when they benefit the market as a whole. Common public foundations can help lower barriers to participation, preserve contestability and strengthen resilience by reducing dependence on any single private provider or infrastructure. But interoperability also requires governance of standards, access and responsibilities at the level at which integration is sought. Achieving that coordination is challenging, particularly when it has to extend across jurisdictions. In this regard, the European Union can build on the size of its market and the degree of harmonization across its Member States.

The broader challenge is therefore to support a more integrated and competitive financial market, while avoiding fragmentation across platforms, infrastructures and liquidity pools.

Public foundations for a competitive digital ecosystem

The public side is already adapting through initiatives such as the digital euro, Pontes and Appia.¹¹ For Banca d'Italia, this builds on a long-standing operational role in developing and running the Eurosystem's market infrastructures, from TARGET services to T2S and TIPS.

⁹ Since open standards also benefit competitors, private incentives to provide compatibility may fall short of the social optimum, especially for firms with a large installed base (Katz and Shapiro, 1985). On the risk of market fragmentation when competing tokenization initiatives are not interoperable, see Agur and Copestake (2025). Network effects can produce both excess inertia, when each participant waits for others to join, and lock-in to early choices (Farrell and Saloner, 1985; Katz and Shapiro, 1986; Arthur, 1989); on network effects in banks' adoption of electronic payments, see Gowrisankaran and Stavins (2004). On efficiency gains within institutions that may be offset by frictions across them, see Angelini (2026).

¹⁰ This refers more broadly to infrastructures and standards developed outside the governance arrangements, strategic choices and effective influence of market participants. Such infrastructures and standards may be controlled by a limited number of platform operators, technology providers or other third parties, whether domestic or foreign. The resulting dependence may reduce contestability, constrain participants' ability to influence the evolution of the market and increase switching costs if proprietary solutions become entrenched.

¹¹ Pontes and Appia represent two complementary horizons of the Eurosystem's strategy for wholesale settlement (ECB, 2025a, 2025b, 2026). Pontes responds to more immediate market needs by building a bridge between market DLT platforms and existing TARGET Services, allowing transactions in tokenized assets to be settled in central bank money. Appia looks further ahead, exploring a natively digital and interoperable infrastructure for the settlement of tokenized financial assets. Together, they show how the Eurosystem can act as an architect *ex ante*: not by prescribing a single technological solution, but by providing trusted foundations on which innovation can develop safely as markets and technologies evolve. On common standards, legal certainty and public-private cooperation as conditions for an integrated European market for tokenized assets, see also Cipollone (2026b). Banca d'Italia contributes to the Eurosystem's work on the digital euro and on Pontes and Appia, supporting both the connection of market DLT platforms to TARGET Services and the exploration of a longer-term integrated and interoperable ecosystem for tokenized finance.

The digital euro would extend the public monetary anchor to retail digital payments. In wholesale markets, Pontes and Appia address a related issue: how central bank money, liquidity and collateral can remain available and effective, as securities and transactions move onto new platforms. Pontes responds to the immediate need by connecting market DLT platforms to TARGET Services, enabling transactions to be settled in central bank money without requiring the market to converge on a single ledger or abandon existing investments. Appia looks further ahead, exploring the longer-term architecture, including interoperability, liquidity and collateral mobility, and resilience.

But public initiatives can only lay the groundwork. Which services customers use, which use cases and business models create value will depend on private intermediaries.

Strategic implications for banks

This brings me to the implications for market participants, and in particular for banks, which I would group around three questions.

The first question is: *how might the financial value chain evolve, and where will banks retain distinctive roles?*

Digitalization may redistribute functions that are today concentrated within banks and market infrastructures across platforms, technology providers and other intermediaries. Some post-trade processes may become more standardized or automated; customer relationships may increasingly be mediated through virtual wallets, trading platforms, treasury systems or embedded applications. This matters not only for banks, but also for market infrastructures such as Central Securities Depositories and Central Counterparties, whose role may evolve as issuance, trading, settlement and collateral management become more closely integrated.

For banks, however, some functions remain distinctive: creating money through credit, allocating and bearing risk, providing balance-sheet capacity and liquidity, and maintaining trusted customer relationships. If another operator controls the interface, a bank may still provide these functions while becoming less visible to the customer and less able to shape the service itself. At the same time, proximity and trust remain powerful advantages. This means that digital tools and specifically a strong position at the customer interface can help banks with established customer relationships deepen them and expand the services built around them. For new entrants, in turn, payments can provide a low-friction way to acquire customers, set up a position at the customer interface, and gradually expand into deposits, savings or credit.

The strategic issue is therefore where banks can continue to create distinctive value as functions and profitability shift across the value chain and control of the customer interface becomes more contested.

The second question is: *how might the role of banks evolve in managing money, liquidity and collateral?*

For commercial bank money to keep playing a key role in digital markets, it must be usable in the environments where customers transact. The precise form may differ across

use cases. What counts is whether banks remain able to provide the money and liquidity that support activity on new platforms, rather than whether one particular instrument, for example tokenized deposits, succeeds.

Liquidity and collateral matter just as much. While atomic settlement can reduce principal risk, it does not reduce liquidity needs. If funds are split across platforms, liquidity needs may increase. This raises questions about where liquidity will be held, how it will move between traditional and tokenized markets, whether collateral can be mobilized across networks, and what this implies for treasury management, intraday credit, funding, and the use of the balance sheet.

These choices affect the economics of participation. A technically attractive use case may not be viable if it requires permanent pre-funding, or if collateral cannot move efficiently in and out of platforms. Conversely, faster mobilization of assets and more automated intraday transactions may create value well beyond settlement itself.

The third question is: *how might standards and capabilities shape the position of market participants in the emerging ecosystem?*

Standards govern more than just technical communication. They affect the portability of assets, the structure and visibility of data, access to services, and the allocation of responsibilities among participants. They also determine what information must be visible, what can remain confidential, and how accountability and supervisory access are preserved. They can foster market competition or reinforce an incumbent's position.

While the architecture is still open, market participants can contribute to shaping these standards. As the ecosystem matures, the scope to influence them may narrow, and firms may increasingly have to adapt to the standards established by platform providers, technology firms or institutions in other jurisdictions. Participation in Pontes and Appia should be understood in this broader sense, as a channel through which markets' requirements concerning liquidity, collateral, confidentiality, resilience, and business models inform the design of the future market.

Investing under uncertainty

The obvious objection is that the case for investing now is not yet proven. The final architecture and the scale of future demand are uncertain: tokenized assets are still a very small fraction of traditional ones¹² and deployment of tokenized deposits also remains limited.¹³ Some institutions may reasonably question whether the benefits justify the costs.

¹² Banu et al. (2026) estimate tokenized assets on public blockchains at €38 billion in February 2026, up from €7.4 billion at the start of 2024, compared with global assets of €241 trillion at end-2025. Their estimate excludes repos and is not a comprehensive measure of tokenization on private ledgers. The article reports limited evidence of secondary trading.

¹³ In its September 2026 response to the MiCA review, the EBA reports limited live or pilot deployment despite growing industry interest (EBA, 2026).

Economic theory takes this concern seriously. When investment is partly irreversible and uncertainty is resolved over time, waiting has an option value.¹⁴ But waiting also has costs when it delays learning or the creation of future opportunities. Where investments remain useful across different outcomes, or create future options, it makes sense to start on a limited scale before uncertainty disappears.¹⁵ In this setting, flexibility and staged commitment can reconcile caution with innovation, without requiring an early bet on a single technological path.

Two features of this transition reinforce this point. First, some of the information needed to reduce uncertainty is produced by experimentation. Viable technologies, use cases and business models are tested and refined by those who are willing to try them. If everyone waits for others to move first, the market learns too little, too slowly, and too late.¹⁶

Recent market feedback on the need to have access to central bank money before the market can scale digital-asset issuance illustrates the same point: some constraints only become clear through practical experimentation. Pontes, launched in September, addresses this constraint.¹⁷

Second, these are markets characterized by network effects and coordination externalities. Participation of private institutions influences which infrastructures reach scale, which standards gain traction and how quickly experimentation moves towards broader adoption. Early choices can therefore have lasting effects.

These arguments suggest a middle course between committing too early and waiting for the market to settle. The literature on decision-making under deep uncertainty points to 'no-regret' investments whose benefits extend across a range of plausible outcomes, including slow adoption, combined with staged commitments that can be scaled up or

¹⁴ On the option value of waiting under irreversibility, see Bernanke (1983), McDonald and Siegel (1986) and Dixit and Pindyck (1994). Expected improvements in a technology can also rationally delay its adoption (Rosenberg, 1976). Empirically, higher uncertainty makes firms more cautious in investing and hiring (Bloom, Bond and Van Reenen, 2007; Bloom, 2009).

¹⁵ Under particular assumptions, uncertainty can increase investment when the marginal return to capital is convex in the uncertain variable (Abel, 1983; Bloom, 2014), or when early investment creates strategic growth options (Kulatilaka and Perotti, 1998). Flexible and staged investments can preserve future choices (Kogut and Kulatilaka, 1994; Trigeorgis, 1996).

¹⁶ When experimentation generates information observable by others, learning spills over across agents and free riding can reduce incentives to experiment (Bolton and Harris, 1999). On experimentation and learning about technologies and business models, see Kerr, Nanda and Rhodes-Kropf (2014).

¹⁷ Lagarde (2026) reports industry feedback that access to settlement in central bank money is needed for issuance at scale and calls on the market to invest and agree common standards. Pontes was launched on 21 September 2026 with an initial set of services and a first group ready to use it. Functionality and operating hours will expand gradually, with full implementation expected by 2028 (ECB, 2026c).

abandoned as more information becomes available.¹⁸ In this context, investments that retain value across different possible architectures are especially useful: modular systems, common data standards, digital asset expertise, programmable processes and stronger links across treasury, payments and securities functions. They also affect how quickly an intermediary or a payment service provider can absorb new technologies once the architecture becomes clearer. Many accumulate gradually and cannot be built at short notice.¹⁹

Experimentation also requires coherent internal governance. Knowledge generated in separate pilots in payments, securities, treasury or innovation teams has to be brought together across business lines and assessed alongside resilience, security, regulatory obligations and customer interests. Responsible innovation means making experimentation sustainable and scalable, so that successful pilots can move into core activities.²⁰

Not every technical choice needs to be made immediately. Capabilities, governance and organizational learning become increasingly valuable while the market is taking shape. Waiting may reduce some technological uncertainty, but it may also mean entering the market when standards, infrastructures and market practices have begun to consolidate.

Conclusions

Let me conclude by returning to the central argument. The two-tier system remains a sound framework for the digital economy, but its form will continue to evolve. Its future will depend on public institutions preserving a common monetary anchor and trusted foundations, and on banks and other private actors continuing to experiment, invest, and develop services that respond to genuine economic needs.

Uncertainty around the final architecture argues for flexibility rather than passivity: building capabilities that remain valuable across different scenarios and staying engaged while standards, infrastructures, and market practices are still taking shape. The monetary anchor should remain common, even if the payment rails are not.

¹⁸ Strategic foresight can help identify ‘no-regret’ actions by exploring alternative plausible futures and assessing which capabilities and investments remain valuable across them (Schoemaker, 1995; OECD, 2025). The process can involve scanning for emerging trends and weak signals of change, challenging underlying assumptions, and using these insights to develop scenarios. In this setting, scenarios can be used to test investment choices against different paths for technology, market adoption and regulation, and to identify developments that would warrant revisiting those choices. For applications of strategic foresight and scenario planning to digital finance and the fintech ecosystem, see Scotti (2025a). On robust decisions across plausible scenarios, see Lempert, Popper and Bankes (2003). On staged investment and real options, see Trigeorgis (1996) and McGrath (1999).

¹⁹ The ability to recognize, assimilate and apply external knowledge depends on prior related investment (absorptive capacity; Cohen and Levinthal, 1990). Building capabilities rapidly can be costly because of time-compression diseconomies (Dierickx and Cool, 1989). Returns to general-purpose technologies can depend on complementary intangible investment that precedes measured productivity gains (Brynjolfsson, Rock and Syverson, 2021).

²⁰ On ‘architectural innovation’ and the difficulty incumbents face when an innovation changes the linkages between components, see Henderson and Clark (1990).

As central banks, we have a role in helping provide the trusted and resilient foundations on which innovation can develop safely, while also fulfilling our regulatory and supervisory responsibilities. Innovation and stability should reinforce each other.

References

- Abel, A.B. (1983), 'Optimal investment under uncertainty', *American Economic Review*, 73(1), pp. 228-233.
- Agur, I., Copestake, A. (2025), 'Optimal policy for financial market tokenization', *IMF Working Paper*, 2025/185.
- Angelini, P. (2026), 'DLT and stablecoins: where do we stand?', speech delivered at the Banca d'Italia-NABE International Economic Symposium, Rome, 20 April.
- Armeliu, H., Claussen, C.A., Hendry, S. (2020), 'Is central bank currency fundamental to the monetary system?', *Sveriges Riksbank Economic Review*, 2020:2, pp. 19-32 (also published as Bank of Canada Staff Discussion Paper, 2020-2).
- Arthur, W.B. (1989), 'Competing technologies, increasing returns, and lock-in by historical events', *Economic Journal*, 99(394), pp. 116-131.
- Bank for International Settlements (2026), 'Anchoring trust in money: innovation beyond stablecoins', *Annual Economic Report 2026*, ch. III, June.
- Banu, E., Born, A., Evrard, J., Lambert, C., Spolaore, A. (2026), 'Towards an efficient and integrated digital capital market in Europe: the role of tokenisation and the Eurosystem's policy response', *Macprudential Bulletin*, 33, European Central Bank, April.
- Bernanke, B.S. (1983), 'Irreversibility, uncertainty, and cyclical investment', *Quarterly Journal of Economics*, 98(1), pp. 85-106.
- Bindseil, U. (2004), *Monetary Policy Implementation: Theory, Past, and Present*, Oxford University Press.
- Bloom, N. (2009), 'The impact of uncertainty shocks', *Econometrica*, 77(3), pp. 623-685.
- Bloom, N. (2014), 'Fluctuations in uncertainty', *Journal of Economic Perspectives*, 28(2), pp. 153-176.
- Bloom, N., Bond, S., Van Reenen, J. (2007), 'Uncertainty and investment dynamics', *Review of Economic Studies*, 74(2), pp. 391-415.
- Bolton, P., Harris, C. (1999), 'Strategic experimentation', *Econometrica*, 67(2), pp. 349-374.
- Brynjolfsson, E., Rock, D., Syverson, C. (2021), 'The productivity J-curve: how intangibles complement general purpose technologies', *American Economic Journal: Macroeconomics*, 13(1), pp. 333-372.

Cipollone, P. (2026a), 'The digital euro in a fragmenting world: ensuring Europe's resilience and autonomy in payments', public lecture hosted by the Stockholm School of Economics in Riga and Latvijas Banka, Riga, 1 April.

Cipollone, P. (2026b), 'From vision to delivery: building Europe's tokenised financial market', speech at the Deutsche Bundesbank's Symposium on 'Future of payments: trends and innovations in Germany and Europe', Frankfurt am Main, 26 August.

Cohen, W.M., Levinthal, D.A. (1990), 'Absorptive capacity: a new perspective on learning and innovation', *Administrative Science Quarterly*, 35(1), pp. 128-152.

Committee on Payment and Settlement Systems (2003), *The role of central bank money in payment systems*, BIS.

Committee on Payment and Settlement Systems (2005), *Central bank oversight of payment and settlement systems*, BIS.

Dang, T.V., Gorton, G., Holmström, B. (2020), 'The information view of financial crises', *Annual Review of Financial Economics*, 12, pp. 39-65.

Dierickx, I., Cool, K. (1989), 'Asset stock accumulation and sustainability of competitive advantage', *Management Science*, 35(12), pp. 1504-1511.

Dixit, A.K., Pindyck, R.S. (1994), *Investment under Uncertainty*, Princeton University Press, Princeton.

European Banking Authority (2026), Response to the European Commission's targeted consultation on the review of MiCA, 24 September.

European Central Bank (2025a), *The Eurosystem's exploratory work on new technologies for wholesale central bank money settlement*, June.

European Central Bank (2025b), 'ECB commits to distributed ledger technology settlement plans with dual-track strategy', press release, 1 July.

European Central Bank (2026a), *Appia: paving the way for a future-ready, integrated financial ecosystem leveraging tokenisation and DLT*.

European Central Bank (2026b), 'Eurosystem unveils Appia roadmap for Europe's tokenised finance', press release, 11 March.

European Central Bank (2026c), 'Eurosystem brings central bank money to tokenised finance', press release, 21 September.

Farrell, J., Saloner, G. (1985), 'Standardization, compatibility, and innovation', *RAND Journal of Economics*, 16(1), pp. 70-83.

Gorton, G. (2017), 'The history and economics of safe assets', *Annual Review of Economics*, 9, pp. 547-586.

Gorton, G., Pennacchi, G. (1990), 'Financial intermediaries and liquidity creation', *Journal of Finance*, 45(1), pp. 49-71.

- Gowrisankaran, G., Stavins, J. (2004), 'Network externalities and technology adoption: lessons from electronic payments', *RAND Journal of Economics*, 35(2), pp. 260-276.
- Henderson, R.M., Clark, K.B. (1990), 'Architectural innovation: the reconfiguration of existing product technologies and the failure of established firms', *Administrative Science Quarterly*, 35(1), pp. 9-30.
- Holmström, B. (2015), 'Understanding the role of debt in the financial system', *BIS Working Paper*, 479.
- Katz, M.L., Shapiro, C. (1985), 'Network externalities, competition, and compatibility', *American Economic Review*, 75(3), pp. 424-440.
- Katz, M.L., Shapiro, C. (1986), 'Technology adoption in the presence of network externalities', *Journal of Political Economy*, 94(4), pp. 822-841.
- Kerr, W.R., Nanda, R., Rhodes-Kropf, M. (2014), 'Entrepreneurship as experimentation', *Journal of Economic Perspectives*, 28(3), pp. 25-48.
- Kogut, B., Kulatilaka, N. (1994), 'Options thinking and platform investments: investing in opportunity', *California Management Review*, 36(2), pp. 52-71.
- Kulatilaka, N., Perotti, E.C. (1998), 'Strategic growth options', *Management Science*, 44(8), pp. 1021-1031.
- Lagarde, C. (2026), 'Money in transition', opening speech at the ECB conference 'Money in transition: digitalisation and innovation in payments', Frankfurt am Main, 15 June.
- Lempert, R.J., Popper, S.W., Bankes, S.C. (2003), *Shaping the Next One Hundred Years: New Methods for Quantitative, Long-Term Policy Analysis*, RAND Corporation, Santa Monica.
- McDonald, R., Siegel, D. (1986), 'The value of waiting to invest', *Quarterly Journal of Economics*, 101(4), pp. 707-727.
- McGrath, R.G. (1999), 'Falling forward: real options reasoning and entrepreneurial failure', *Academy of Management Review*, 24(1), pp. 13-30.
- OECD (2025), *Strategic Foresight Toolkit for Resilient Public Policy: A Comprehensive Foresight Methodology to Support Sustainable and Future-Ready Public Policy*, OECD Publishing, Paris.
- Padoa-Schioppa, T. (2004), 'Shaping the payment system: a central bank's role', Bank of Korea Conference on Payment Systems, Seoul, 13 May.
- Panetta, F. (2026a), 'Trade and finance in a fragmented world', speech at the 32nd ASSIOM FOREX Congress, Venice, 21 February.
- Panetta, F. (2026b), 'Interconnect to stabilize: cross-border payments in a fragmenting world', speech at the conference 'Cross-border payments at a turning point', Embassy of Italy to the United Kingdom, in cooperation with the Institute of International Finance and the Committee on Payments and Market Infrastructures, London, 5 May.

Rosenberg, N. (1976), 'On technological expectations', *Economic Journal*, 86(343), pp. 523-535.

Ryu, J., Shin, H.S., Sung, J., Yun, S.G. (2026), 'A unified ledger in practice: lessons from Project Hangang', paper prepared for the ECB Forum on Central Banking, Sintra, 1 July.

Schoemaker, P.J.H. (1995), 'Scenario planning: a tool for strategic thinking', *Sloan Management Review*, 36(2), pp. 25-40.

Scotti, C. (2025a), 'Journey to the future of the financial system', speech at the ASSIOM FOREX Annual Congress, Turin, 14 February.

Scotti, C. (2025b), 'Euro digitale, cripto-attività e finanza digitale', hearing before the Parliamentary Commission of Inquiry into the banking, financial and insurance system, Rome, 24 July (in Italian).

Scotti, C. (2026), 'From the winter Olympics to the digital euro: a dialogue between academia and central banks', 6th Dolomiti Macro Meeting, Bolzano/Bozen, 20 June.

Trigeorgis, L. (1996), *Real Options: Managerial Flexibility and Strategy in Resource Allocation*, MIT Press, Cambridge (Mass.).