Monetary Policy Without Cash?

An IS-LM Analysis of Transmission in a Cashless Society

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Abstract. This paper asks whether monetary policy remains effective when physical cash largely disappears. Using a theory-driven IS-LM analysis, published money-demand estimates, and official indicators from the euro area, China, and the United States, it distinguishes a cashless society from a moneyless economy. Digital payments may reduce transaction balances and alter the income coefficient of money demand, while financial innovation may change interest sensitivity on both the LM and IS sides. The analysis now makes explicit that the standard comparative statics describe an interior equilibrium: when the policy rate reaches an effective lower bound, conventional rate cuts become less reliable, even if the disappearance of banknotes weakens the physical cash constraint. Empirical estimates suggest that money-demand parameters vary materially across aggregates and institutional settings, while observed digitalisation has not eliminated currency holdings. Monetary policy therefore remains viable, but implementation should rely on remunerated reserves, a clearly designed floor or corridor, standing facilities, and—when the lower bound binds—forward guidance, asset purchases, or targeted liquidity operations. The transition should also preserve inclusion, privacy, and payment-system resilience.

Keywords: cashless society; monetary policy; IS-LM model; money demand; digital payments; interest-rate transmission

1 Introduction

Digital payments and prospective central-bank digital currencies are reducing the transactional role of banknotes and coins (Hwang & Wen, 2024; Ogachi et al., 2021). This has revived a central question: if cash disappears, will central banks lose their ability to influence interest rates, investment, output, and employment? The concern is intuitive, but it risks confusing the physical form of money with the economic functions of liquid balances.

A cashless society is not a moneyless society. Payments may be settled through commercial-bank deposits, private platforms, or central-bank digital currency, while households and firms continue to hold liquid balances for transactions, precautionary needs, and portfolio adjustment. Digitalisation may alter money-demand parameters and investment sensitivity, but it does not remove the foundations of monetary transmission

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B. P. Siba et al. (eds.), *Proceedings of the 2026 5th International Conference on Public Service, Economic Management and Sustainable Development (PESD 2026)*, Advances in Economics, Business and Management Research 411,
https://doi.org/10.2991/978-94-6239-825-2_21

(Brown et al., 2022; Lu et al., 2024). It may, however, change the location and economic meaning of the effective lower bound.

This paper therefore asks whether cash disappearance eliminates money demand, how it alters the IS and LM curves, how the lower bound modifies the comparative statics, and which operating framework is best suited to a predominantly cashless economy. It argues that monetary policy remains effective, although the appropriate instrument mix shifts toward administered interest rates and state-contingent balance-sheet tools. Payment efficiency should not be the sole criterion because cash may still support privacy, inclusion, budget control, and resilience (Brown et al., 2022; Fujiki, 2020).

2 Conceptual Framework and Methodology

2.1 Scope and Definitions

This paper uses a theory-driven conceptual design. A cashless society is defined as an economy in which banknotes and coins play little role in ordinary transactions, while money persists as deposits or other liquid digital claims. Digital payment refers to the transfer method, digital money to the claim being transferred, and central-bank digital currency to a direct liability of the central bank.

2.2 Evidence Base and Analytical Strategy

The analysis combines official indicators on currency stocks and payment use for the euro area, China, and the United States with a focused narrative synthesis of research on money demand, digital payments, fintech, the lower bound, and monetary-policy implementation. BIS, ECB, and FRED/BEA series are used to establish stylised patterns rather than causal effects. Published estimates are used as empirical anchors for k and h, but not as a harmonised cross-country calibration because studies differ in money aggregates, interest-rate units, samples, and functional form. Comparative statics are applied to a short-run, closed-economy IS-LM model with fixed prices; expectations, bank balance sheets, exchange rates, and distributional effects remain outside the formal benchmark.

2.3 The IS-LM Benchmark

The benchmark model is:

$$Y = A - \beta r, \quad \beta > 0$$

where Y is output, r is the interest rate, A is autonomous demand, and β measures the interest sensitivity of aggregate demand. Money-market equilibrium is:

$$M/P = kY - hr, \quad k, h > 0$$

where M/P is real liquid money, k is the income coefficient of money demand, and h is its interest-rate sensitivity. The analysis considers a decline in k, an increase in h, and an increase in β. These comparative statics assume an interior equilibrium in which the interest rate can adjust sufficiently to clear the money market. At an effective lower bound, the central bank cannot implement an arbitrarily lower market rate through a conventional rate cut, so the benchmark must be supplemented by bank-funding, expectations, and balance-sheet channels.

3 Results

3.1 Cashless Payments Do Not Eliminate Cash or Money Demand

Cashless payments do not automatically eliminate cash holdings or money demand. Table 1 reports selected observable indicators. In China, total banknotes and coins rose from 8.7% of GDP in 2020 to 9.9% in 2024 while the number of payment cards also increased. In the United States, the currency-to-GDP ratio declined from about 10.0% to 8.1%, while annual cashless transactions rose from 167 billion to 220 billion. In the euro area, cash use at the point of sale fell sharply, yet outstanding banknotes remained above 10% of GDP. Digital adoption and currency stocks can therefore move in different directions.

The divergence is economically important. Cash may lose transaction share while remaining a store of value, precautionary asset, privacy-preserving instrument, or crisis reserve. Accordingly, a fall in transaction demand should not be equated with the disappearance of money demand or with a one-for-one decline in currency holdings.

Table 1. Selected Cash and Digital-Payment Indicators and Empirical Money-Demand Anchors

Context	Currency indicator	Digital-payment indicator	Empirical anchor and interpretation
Euro area	Banknotes remained >10% of GDP during 2015–2024.	Cash share of POS transactions: 72% (2019) → 52% (2024).	Transaction use fell faster than the currency stock; no direct harmonised k/h calibration follows.
China	Total banknotes and coins/GDP: 8.7% (2020) → 9.9% (2024).	Payment cards: 8.95 bn (2020) → 9.91 bn (2024).	Income elasticity 0.60–0.75 and weak interest effect; 1% higher e-payments lowers M1 about 0.01% in the long run.
United States	Total banknotes and coins/GDP: 10.0% (2020) → 8.1% (2024).	Cashless transactions: 167 bn (2020) → 220 bn (2024).	Long-run M1 income elasticity ≈0.50 and interest semi-elasticity ≈−0.05.

Note: Indicators are jurisdiction-specific and not directly comparable. Ratios use year-end currency stocks and annual nominal GDP. Sources: BIS CPMI tables; ECB SPACE 2024 and ECB cash-circulation analysis; FRED/BEA; Ball (2001); Zuo and Park (2011); Hwang and Wen (2024).

3.2 The LM Curve Changes Through More Than One Channel

The LM slope is k/h. If digital payments reduce the balances required per unit of income, k falls and the LM curve becomes flatter. A rise in h can also flatten the curve, but the two changes have different policy effects. Because empirical money-demand studies generally use log or semi-log specifications, their reported income elasticities and interest semi-elasticities are empirical counterparts rather than literal estimates of the linear coefficients k and h.

$$\partial Y * / \partial (M/P) = \beta / (h + \beta k) > 0$$

From the solved model, a decline in k increases the output response to real-money expansion, whereas an increase in h reduces it. The empirical anchors in Table 1 make the comparison more concrete but also caution against large mechanical claims. Ball (2001) estimates a U.S. M1 income elasticity of about 0.50 and an interest semi-elasticity of about −0.05. Zuo and Park (2011) estimate Chinese income elasticities of 0.60–0.75 and find a weak, though gradually strengthening, interest effect. Hwang and Wen (2024) estimate that a 1% increase in electronic payments lowers Chinese M1 demand by only about 0.01% in the long run. Thus digitalisation may lower transaction demand gradually, while the size of h remains aggregate- and institution-specific.

3.3 A More Interest-Sensitive Economy Flattens the IS Curve

Fintech can reduce financing and participation costs and make investment more responsive to interest rates (Lu et al., 2024). In the model, this raises β and flattens the IS curve.

$$\partial Y / \partial r_policy = -\beta$$

A larger β strengthens the output response to a policy-rate change. Actual transmission may still be limited by bank pass-through, risk premia, financial segmentation, or the lower bound, but the IS-LM mechanism remains informative away from those constraints.

3.4 The Lower Bound Changes the Policy Experiment

The derivative $\partial Y / \partial r_policy = -\beta$ assumes that the administered policy rate can be moved. Once household deposit rates or other key market rates reach an effective lower bound, further cuts may pass through only partially and with longer lags. Eliminating banknotes can weaken the physical incentive to switch into cash, but it does not remove lower bounds created by deposit-rate stickiness, bank profitability, legal constraints, substitute assets, or public confidence. Evidence from negative-rate regimes shows continued but heterogeneous transmission: low-deposit or wholesale-funded banks may expand lending, while high-deposit banks can face compressed margins and weaker lending (Getz Wold, 2024; McLeay et al., 2026). Cashlessness therefore widens the technical range for rate cuts without making that range unlimited.

When the effective lower bound binds, a larger monetary base need not lower the short rate or stimulate spending through the ordinary LM experiment. The relevant comparison becomes a package of administered negative rates, asset purchases, forward guidance, and targeted lending or liquidity facilities. Quantitative easing and forward guidance can ease financial conditions when conventional short rates are constrained, but their effects operate through term premia, expectations, and credit conditions that are outside the static IS-LM benchmark (Bernanke, 2020).

3.5 Monetary Policy Remains Effective, but the Operating Framework Changes

Under normal conditions, the central bank should implement policy through an administered rate on reserve balances, supported by a clearly specified floor or corridor. Interest on reserves anchors the overnight rate in an ample-reserves floor; deposit and lending standing facilities bound it in a corridor, while open-market or refinancing operations supply the required liquidity (Whitesell, 2006; Kashyap & Stein, 2012; Baglioni, 2024). If a CBDC or other digital claim drains bank deposits and reserves, reserve remuneration, access to standing credit, and—where necessary—tiered remuneration or holding limits should be adjusted to avoid abrupt disintermediation (Abad et al., 2025). At the effective lower bound, the framework should add forward guidance, asset purchases, and targeted longer-term funding rather than relying on an indefinitely negative policy rate, as shown in table 2.

Table 2. Comparative-Static Effects of a Cashless Transition

Change	Economic meaning	Curve effect	Quantity-based policy	Policy-rate transmission
$k \downarrow$	Lower transaction balances per unit of income	LM flatter	Output response to M/P rises, all else equal	No direct effect; may improve rate pass-through indirectly
$h \uparrow$	Money demand more interest-sensitive	LM flatter	Output response to M/P falls	Rate targeting avoids relying on unstable money demand
$\beta \uparrow$	Investment/aggregate demand more rate-sensitive	IS flatter	Can amplify the rate channel of monetary expansion	Output response to a policy-rate change strengthens
Cash $\rightarrow 0$	Physical currency displaced by digital claims	No unique slope implication	Policy remains feasible; effect depends on parameters and operations	May widen scope for negative rates, subject to institutional constraints
r at ELB	Conventional short-rate cuts are constrained	Interior IS-LM comparative statics are insufficient	Reserve expansion may not reduce the short rate	Use guidance, asset purchases, and targeted facilities

4 Discussion and Policy Implications

4.1 Resilience Does Not Mean Institutional Continuity

Monetary policy is resilient because its essential mechanism operates through liquid settlement assets, administered rates, financing conditions, and aggregate demand rather than through paper currency. Resilience does not imply institutional continuity: digitalisation can change money-demand stability, reserve demand, bank funding, and policy-rate pass-through. The static model therefore identifies parameter channels, while the lower-bound discussion identifies where additional mechanisms become decisive.

4.2 Efficiency Is Not the Only Function of Money

Payment efficiency is not the only social function of money. Cash can provide offline resilience, privacy, budget control, and access for people with limited digital capability. A compulsory withdrawal could disproportionately affect older people, low-income households, migrants, and small businesses, while concentrating operational risk in a few platforms.

4.3 Policy Design for a Predominantly Cashless Economy

Central banks should translate "price-based instruments" into an explicit operating sequence. First, announce a target or administered policy rate and remunerate reserve balances consistently with that target. Second, use a deposit facility as a floor and a collateralised standing lending facility as a ceiling, or operate an ample-reserves floor when reserve supply is deliberately abundant. Third, preserve routine refinancing and emergency liquidity arrangements so that a shift from deposits into CBDC or private digital money does not create a funding cliff. Fourth, when the effective lower bound binds, activate forward guidance, asset purchases, and targeted longer-term refinancing rather than treating negative rates as unbounded. The choice between a floor and corridor should depend on reserve abundance, money-market activity, and the scale of CBDC adoption, while offline public-money access and redundant payment channels should be retained.

5 Conclusion

The disappearance of physical cash would change monetary operations but would not remove liquid balances, portfolio choice, interest-sensitive investment, or central-bank influence over financing conditions. Observable data show that digital payment adoption can rise while currency stocks remain substantial, and empirical estimates suggest that changes in money demand are gradual and institution-dependent. The key question is therefore how k, h, β, and the operating framework change.

A lower k and a higher h both flatten the LM curve but have opposite implications for quantity-based expansion; a higher β flattens the IS curve and strengthens policy-rate transmission away from the lower bound. When the effective lower bound binds, rate cuts must be supplemented by forward guidance, asset purchases, and targeted liquidity tools. Monetary policy is therefore resilient in a cashless economy, but implementation should become more explicitly rate-based, operationally specified, and attentive to bank funding, inclusion, privacy, and payment resilience.

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