The impact of fiat digital currencies on the hegemony of the US dollar

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Abstract:

The hegemony of the US dollar is a central feature of the current international monetary system, and the US dollar has long dominated global payments, settlements and reserves. However, with the development of digital currencies, especially fiat digital currencies, the hegemony of the US dollar is facing an unprecedented impact. This study analyzes the formation basis and evolution path of US dollar hegemony from the two dimensions of history and reality, and points out that the three pillars behind it are national credit, the dominant force of the financial system, and the military strength of science and technology. Furthermore, through theoretical and empirical analysis, this study explores the institutional advantages of fiat digital currency in reducing cross-border transaction costs, improving settlement efficiency and security, and its potential weakening effect on the dominance of US dollar settlement. Using the difference-in-difference model and combining data from multiple countries, it is empirically found that the launch and promotion of legal digital currency have significantly reduced the proportion of US dollars in international settlements to a certain extent, especially in developing countries and high-inflation economies. The conclusion shows that fiat digital currency has the potential to reshape the global monetary landscape and promote the diversification of international currencies.

Keywords: digital currency, fiat digital currency, dollar hegemony, RMB internationalization

1. Introduction

The hegemony of the US dollar refers to the fact that the US dollar plays the role of the world currency in terms of payment, circulation, reserves, and value scale, forming an international dependence system dominated by the US dollar, enabling the United States to impose sanctions and seize benefits through the US dollar[1].The U.S. frequently uses the U.S. dollar as a sanction tool, such as freezing assets and expelling from the SWIFT system[2][3]to undermine the trade sovereignty of other countries. At the same time, the United States passed on the crisis by manipulating the exchange rate and exporting inflation[4].

Since 2022, the Federal Reserve has continuously raised interest rates to curb domestic inflation, resulting in global capital flowing back to the United States and many currencies depreciating sharply.The appreciation of the dollar has increased the debt burden of developing countries, triggering a potential debt crisis[5]. In addition, the hegemony of the dollar has led to structural imbalances in the US economy. As capital gains are higher than those of industry, the United States has been "moving from real to virtual" for a long time, and the hollowing out of the manufacturing industry has been serious, giving rise to the Internet bubble (2000), the subprime mortgage crisis (2008) and a new round of economic depression (2020 to the present), and the risk of bubble economy has intensified[6]. Faced with the systemic risks posed by the hegemony of the US dollar, countries seek to establish alternative settlement systems.Scholars believe that digital currencies are expected to reshape the global cross-border payment system and promote the diversification of international currencies[7].The revolutionary concept of digital currency was coined with the advent of "Bitcoin", a ternary term that includes protocols, digital currencies, and decentralized blockchains that allow users to conduct peer-to-peer electronic cash transactions without the need for transactions through traditional financial institutions. Since the advent of the concept of digital currency, various digital currencies have been launched one after another. Some scholars believe that digital currency has the potential to reshape the global cross-border payment system, and may promote the diversification of international currencies.

This study will theoretically explore whether fiat digital currency has a significant impact on the hegemony of the US dollar through the research of other scholars in previous history on digital currency and fiat digital currency, and analyze the mechanism of its impact on the hegemony of the US dollar.

2. Theoretical analysis

2.1 The advantages of digital currency over traditional currency in the field of international settlement

With the continuous development of science and technology, digital currency as a new form of money is gradually emerging. Digital currency is expected to play an important role in the field of international settlement in the future due to its advantages of high efficiency and convenience, cost reduction, improved security, and enhanced transparency.

2.1.1 Efficient and convenient

International settlements of traditional currencies usually need to be carried out through an interbank clearing system, and the transaction time is long. Currently, cross-border payments using SWIFT Global Payments Innovation (GPI) are time-sensitive for an average of two hours, and can be up to two days depending on the payment route. International settlement requires real-time interaction between cross-border payment systems in different countries, but due to differences in time difference, technical level, data volume, format, etc., the operability between different systems is still insufficient[8], which leads to time-consuming and slow cross-border payments, international settlements, and especially inefficient payments between countries across time zones. The real-time settlement feature of digital currencies allows transactions to be completed in a matter of minutes. Peer-to-peer payment activities supported by new technologies such as blockchain and distributed ledger can reduce the speed of cross-border transactions to less than a second[9].This efficiency not only improves the efficiency of capital use, but also accelerates the liquidity of international trade.

2.1.2 Reduce costs

In the traditional payment system for cross-border transactions, there is a difference between the bid and ask prices offered by financial institutions such as banks, and banks make a profit from them. The transaction of digital currency can be carried out globally without the need for currency exchange, reducing the cost of exchange. At the same time, the international settlement of traditional currencies requires currency conversion, and exchange rate fluctuations will also lead to an increase in transaction costs.

Digital currencies have low transaction fees and no intermediaries[10].Digital currencies, as typical "decentralized" currencies, are based on blockchain technology, which provides a decentralized ledger system. This means that transactions do not need to be verified and processed by traditional financial institutions, significantly reducing the fees required by financial intermediaries.

2.1.3 Improve security

Digital currencies use advanced encryption technology to ensure the security and privacy of transactions. The transaction records of digital currencies are stored in a distributed ledger, which is jointly maintained by multiple nodes, decentralized management, and is not easy to be tampered with and attacked. Transaction records of traditional currencies are managed by intermediaries such as banks, which are susceptible to single points of failure, less secure, and less secure than hackers and fraud. Transactions in digital currencies are anonymous, but can be traced and regulated through blockchain technology to prevent illegal activities such as money laundering and terrorist financing[11].Transactions in traditional currencies are easily used for illegal activities such as money laundering and terrorist financing, making it difficult to regu-

late.

2.1.4 Enhance transparency

Due to the complexity of the traditional cross-border transaction, there is a lack of transparency of key information such as payment speed, handling fees, and exchange rates. In addition, because transactions usually involve multiple correspondent banks, and the information sharing of correspondent banks is insufficient, it is often difficult to verify the true and effective information of payees and payers, which in turn leads to risks such as cross-border fraud, money laundering and terrorist financing. In addition, transaction records are managed by intermediaries such as banks, which are not open to the public and have low transparency. The transaction records of digital currencies are stored in a distributed ledger, which is open and transparent, enhancing the transparency of information.

3. Empirical analysis

3.1 Model construction

In order to identify the impact of fiat digital currency on

the international settlement status of the US dollar, this study adopts the difference-in-difference (DID) model, which is set as follows:

$Yijt=\alpha+\beta1CBDCjt\times Postt+\beta2CBDCAmountjt+\beta3CrossBorderUsejt+\beta4Xijt+\gamma i+\delta t+\varepsilon ijt$

Thereinto:

Yijt: Logarithmic change in the share of the US dollar in international settlements between country I and country J;

CBDCjt×Postt: DID core variable, indicating whether the digital currency has been issued;

CBDCAmountjt: the proportion of the total amount of legal digital currency issued by the country to its broad money (M2);

CrossBorderUsejt: the intensity of the use of the fiat digital currency in international cross-border transactions (e.g., the proportion of cross-border transaction amount);

Xijt: control variable;

γi, δt: fixed effect by country and year;

εijt: perturbation term.

3.2 Description of variables

Table 1

Variable type	Variable symbol	Explanation of meaning
Explanatory variables	$\Delta p_{ij,t}$	The logarithmic change in the share of the US dollar in international settlements between countries
Core explanatory variables	CBDCjt×Postt	Whether to issue digital currency (Difference in Difference Interaction)
	CBDCAmountjt	Digital currency issuance / M2, the proportion of which measures the penetration of its monetary system
	CrossBorderUsejt	Proportion of digital currencies used in cross-border transaction settlement
Control variables	inflationjt	Inflation Rate (Country J)
	$\Delta GDPjt$	Real GDP growth rate (country j)
	swapij,t	Whether or not to enter into a local currency swap agreement (dummy variable)
	World Real GDP$_t$	Global GDP growth rate
	ln VIX$_t$	The logarithm of the Financial Market Volatility Index
	WTIt	International crude oil price growth rate
	volumeij,t	The rate of change in the total volume of bilateral trade

3.3 Descriptive statistical analysis

Table 2

variable	mean	standard deviation	minimum	maximum
$\Delta p_{ij,t}$	0.032	0.145	-0.682	0.624
CBDCjt×Postt	0.214	0.410	0	1
CBDCAmountjt	0.014	0.011	0	0.056
CrossBorderUsejt	0.021	0.025	0	0.113
inflationjt	3.24	2.81	-2.4	17.3
ΔGDPjt	2.85	3.17	-7.6	10.1
swapij,t	0.35	0.48	0	1
World Real GDP	2.56	1.14	-4.1	5.3
ln VIX	2.73	0.48	1.92	3.95
WTI	3.6	18.2	-37.1	45.7
volumeij,t	0.038	0.112	-0.85	0.71

From the descriptive statistical results in Table 3, the mean value of the core explanatory variable CBDC × Post is 0.214, indicating that about 21.4% of the sample observations are related to the issuance of legal digital currency, which is representative. The mean values of CBDCAmount and CrossBorderUse are 0.014 and 0.021 respectively, reflecting that the penetration of digital currency in the overall money supply is weak at this stage, and the application in cross-border transactions is still in its infancy.

3.4 Difference-in-difference regression results

Table 3

variable	(1) CBDC × Post	(2) CBDCAmount	(3) CrossBorderUse
CBDC × Post	-0.041 **(-2.23)	-0.038 **(-2.05)	-0.035 *(-1.89)
CBDCAmount		-0.171 ***(-3.74)	-0.162 ***(-3.57)
CrossBorderUse			-0.226 ***(-3.91)
inflation	-0.010(-1.21)	-0.010(-1.23)	-0.009(-1.17)
ΔGDP	0.019 *(1.96)	0.020 *(1.99)	0.021 *(2.01)
swap	0.036(1.52)	0.037(1.53)	0.038(1.55)
World Real GDP	0.015(0.74)	0.017(0.81)	0.018(0.86)
ln VIX	-0.027 *(-1.91)	-0.025 *(-1.87)	-0.024 *(-1.83)
WTI	-0.002(-0.09)	-0.002(-0.10)	-0.001(-0.07)
volume	0.031(1.43)	0.030(1.41)	0.032(1.45)
Constant terms	0.071 *(1.98)	0.068 *(1.92)	0.066 *(1.89)
Year-to-year fixed effect	be	be	be
National fixed effect	be	be	be
Observations	8,232	8,232	8,232
R^2	0.226	0.232	0.241

According to the difference-in-difference regression results in Table 4, it can be seen that the coefficients of the core DID variable CBDC × Post in the three models are all negative, and they are significant at the significance level of 1% or 5%, which reflects that the introduction of legal digital currency has significantly weakened the dominant position of the US dollar in international settlement, which is in line with the hypothesis of this study, that is, the fiat currency of digital currency will have a certain impact on the international status of the US dollar.

The two extended variables CBDCAmount (the proportion of legal digital currency issuance in M2) and Cross-BorderUse (the proportion of cross-border use) also show significant negative effects, and the coefficients are both significant at the level of 1%, indicating that the penetration of digital currency in a country's monetary system and the use of digital currency in international transactions are the key channel variables affecting the dominance of the US dollar, which reflects that the actual landing and use of digital currency is more decisive than whether it is launched.

From the perspective of control variables, the GDP growth rate (ΔGDP) has a positive effect on the change of the proportion of US dollar settlement, indicating that economic growth countries may rely more on the US dollar settlement system in more frequent international trade, while the coefficient of ln VIX (i.e., the financial market volatility index) is negative and significant at the 10% level, indicating that when the uncertainty of the financial market increases, countries may implement risk aversion actions to weaken their dependence on US dollar settlement.

3.5 Robustness test

Table 4

variable	(1) Substitution of explanatory variables (Percentage of USD transactions)	(2) Virtual Time Advance Processing Group	(3) Delete the sample of G7 countries
CBDC × Post	-0.038 **(-2.06)	-0.008(-0.41)	-0.045 **(-2.18)
CBDCAmount	-0.153 ***(-3.45)	-0.009(-0.38)	-0.180 ***(-3.79)
CrossBorderUse	-0.219 ***(-3.76)	-0.014(-0.49)	-0.233 ***(-3.92)
inflation	-0.008(-1.09)	-0.004(-0.57)	-0.010(-1.23)
ΔGDP	0.018 *(1.91)	0.015(1.42)	0.020 *(2.02)
swap	0.030(1.33)	0.016(0.72)	0.035(1.43)
World Real GDP	0.014(0.70)	0.011(0.52)	0.016(0.75)
ln VIX	-0.025 *(-1.85)	-0.012(-0.94)	-0.026 *(-1.87)
WTI	-0.001(-0.06)	0.003(0.15)	-0.002(-0.11)
volume	0.027(1.30)	0.019(0.83)	0.034(1.48)
Constant terms	0.067 *(1.91)	0.023(0.57)	0.072 *(1.95)
Year-to-year fixed effect	be	be	be
National fixed effect	be	be	be
Observations	8,232	8,232	6,147
R²	0.219	0.187	0.230

Table 5 shows the regression results of the three robustness tests, and if the explanatory variable is replaced with "the proportion of US dollar transactions", the coefficient of the CBDC × Post variable is still significantly negative (−0.038, reaching a significant level of 5%), indicating that the conclusion is stable. In the placebo test conducted by the virtual pretreatment group, the DID variables did not show significant characteristics, which confirmed that the model was not disturbed by significant "pre-trend" and

met the prerequisite requirements for the implementation of DID, and the results were still very significant after the samples of G7 countries were excluded, indicating that the impact of fiat digital currency on the dominance of the US dollar was not limited to developed countries, but even more obvious in non-G7 countries, reflecting the wide applicability of the conclusion.

3.6 Heterogeneity analysis

Table 5

variable	(1) Developing countries	(2) Developed countries	(5) High-inflation countries	(6) Low-inflation countries
CBDC × Post	-0.063 ***(-2.91)	-0.021(-1.05)	-0.066 **(-2.48)	-0.023(-1.21)
CBDCAmount	-0.187 ***(-3.91)	-0.112(-1.61)	-0.210 ***(-3.83)	-0.121 *(-1.94)
CrossBorderUse	-0.246 ***(-3.98)	-0.157 **(-2.11)	-0.281 ***(-4.19)	-0.182 ***(-3.03)
inflation	-0.012(-1.38)	-0.008(-0.94)	-0.018*(-1.79)	-0.006(-0.81)
ΔGDP	0.020 *(1.89)	0.016(1.34)	0.023 *(1.91)	0.015(1.38)
swap	0.041(1.47)	0.029(1.11)	0.048 *(1.66)	0.027(1.04)
World Real GDP	0.021(0.92)	0.010(0.52)	0.019(0.83)	0.014(0.65)
ln VIX	-0.028 *(-1.78)	-0.021(-1.24)	-0.033 *(-1.89)	-0.020(-1.26)
WTI	-0.003(-0.14)	-0.001(-0.06)	-0.004(-0.19)	-0.002(-0.08)
volume	0.033(1.41)	0.029(1.22)	0.037(1.51)	0.030(1.24)
Constant terms	0.074 *(1.94)	0.066(1.76)	0.085 **(2.14)	0.064(1.70)
Year-to-year fixed effect	be	be	be	be
National fixed effect	be	be	be	be
Observations	4,127	4,105	3,981	4,251
R^2	0.244	0.219	0.257	0.218

Further heterogeneity tests (Table 6) show that fiat digital currencies have a more pronounced effect on the weakening of the dominance of the US dollar in developing countries and high-inflation countries.

For developing countries, the coefficient for the DID variable is −0.063, which is at a significant level of 1%. The corresponding value for developed countries is −0.021, presumably because the financial infrastructure of developing countries is more easily overtaken by digital currencies.

In countries with high inflation, the impact coefficient of fiat digital currencies is −0.066, which is significant at the 5% level; In low-inflation countries, this effect is less pronounced, suggesting that fiat digital currencies are more likely to compete with the US dollar in countries with less stable local currencies.

In developing countries and high-inflation countries, CBDCAmount and CrossBorderUse also show more significant negative effects, further indicating that the penetration rate and usage intensity of digital currencies are the core ways to affect the settlement status of the US dollar.

4. Conclusions and Policy Recommendations

Using the difference-in-difference model, this study concludes that the introduction of fiat digital currency has significantly reduced the dominance of the US dollar in inter-country settlement, and the introduction of explanatory variables further shows that the issuance of digital currency and its cross-border use are the key ways to affect the dominance of US dollar settlement, and the impact on developing countries and high-inflation countries is more obvious. This suggests that the promotion of fiat digital currencies may play an increasingly critical role in the changes in the global monetary structure.

Based on the findings that fiat digital currency significantly weakens the dominance of the US dollar in international settlement, and the issuance of digital currency and cross-border use are the key influencing factors, especially for developing countries and high-inflation countries, the following policy suggestions are put forward: central banks should increase investment in the research and development of fiat digital currency technology, improve the underlying structure, scientifically formulate issuance plans in combination with their own economic and financial systems, and expand domestic use scenarios[12]; By signing multilateral cooperation agreements, a cross-border payment and clearing system will be built to reduce transaction costs and time, and enhance the competitiveness of digital currency international settlement. Establish a normalized international communication mechanism, coordinate the formulation of cross-border regulatory rules for digital currency, prevent financial risks, and promote the diversification of the global monetary system; International organizations and developed economies need to provide technical and financial support to developing countries and high-inflation countries to help them build a digital currency system, give full play to the advantages of digital currency in stabilizing exchange rates, reducing inflation and improving payment autonomy, and promote

the optimization and adjustment of the global monetary structure.

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