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COMPARISON BETWEEN INTERNAL AND ELECTRONIC CLEARING SYSTEMS FOR CHECKS: A CASE STUDY PERTAINING TO THE IRAQI BANKING INDUSTRY

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Abstract

Payment clearing is important to ensure that the payment is transferred or the cash from one bank account moves to the other bank. The banking system in Iraq follows two sorts of clearance systems which are the IBCS (Inter Bank Clearing System) and C-ACH (Check Automated Clearing House System). Though the Central Bank of Iraq (CBI) has already modernized the payment clearing systems, the country's banks still use the interbank clearing systems. In this background, the current study is a first-of-its-kind attempt to compare and contrast the IBCS and C-ACH systems so as to understand the benefits and disadvantages associated with these two clearance systems and identify the optimal one. For this study, the researcher used secondary data available from the CBI for the study period between 2018 and 2022. The collected data was analyzed for descriptive statistics and correlation to validate the hypotheses. The Mann Whitney U test and independent sample T-test were conducted in the study. From the study outcomes, it is clear that there exists a significant difference between the systems' performance in terms of number of transfers in dollars and Iraqi dinars as well as the distribution of bank transfers through checks in dollars and Iraqi dinars. Between the systems (IBCS and C-ACH) under study, the C-ACH system gained prominence with the highest number of transfers and the distribution of bank transfers through checks. The study results confirm the increasing penetration of the electronic clearing system while the policy makers in the government and decision makers at the CBI must devise strategies to bring all the participant banks in the country under a unified clearing system so that the end consumer gains benefits in terms of cost, time, data security, ease and so on.

JEL classification: G21, E42, O33

Keywords: Inter Bank Clearing System (IBCS), Check Automated Clearing House System (C-ACH), Central Bank Of Iraq, Islamic Bank, Bank Payment Clearing System, Iraq Economic Growth

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Introduction

The central bank of Iraq was officially incorporated in 1956, though Iraqi national bank was its precursor, which was started in 1947. Being Iraq's central bank, the Central Bank of Iraq (CBI) issues currency, exercises control on foreign exchange transactions and also supervises the country's banking system (Janabi & Al-Rikabi, 2018). The banking sector plays a crucial role in the development of the Iraqi economy. Despite the fact that the banking sector was liberalized in 2003, there exists some provisions that still restrict the growth of this sector (Kapita, 2022).

According to (Yahoo Finance, 2024), in 2024, the country has a total of 61 commercial banks, 7 state (1 Islamic and 6-Non Islamic) and 54 private banks (29 Islamic and 25 non-Islamic). In terms of total deposits and total credit in the economy, the state-owned banks dominate the banking sector in Iraq. Being the most preferred mode of payment, cash is still considered king in Iraq while the banks suffer due to this attitude among consumers towards non-involvement into the formal banking system. This is attributed to various reasons such as a trust deficit, lack of savings culture, absence of legal provisions to safeguard the interests of end-users, political instability and so on (Tabaqchali et al., 2021). The banking sector is still considered to be a conservative one (Eidan, 2022).

Payment clearing is important to ensure that the payment is transferred or the cash from one bank account moves to the other bank. Such sort of continuous commercial transactions increase society's trust and confidence in the banking system (AL- Badran, 2021). The banking system in Iraq follows two sorts of clearance systems which are IBCS (Inter Bank Clearing System) and C-ACH (Check Automated Clearing House System). CBI defined IBCS as an internal clearing exchange system for the branches of a single bank, especially government banks without a functional or existence of a holistic banking system. This sort of system helps heavily in monitoring the transactions in an accurate manner while it also ensures that the bank branches send and receive the payment orders and instruments encoded in magnetic ink. As of 2019, a total of 5 banks and 20 branches were involved in IBCS. The number of remittances by the Payment order Payable (CT) method was about 5,690,601 in Iraqi dinars and there were 377 transfers in USD (Central Bank of Iraq, 2019a).

On the other hand, being a member of the Sustainable Banking and Finance Network (SBFN) from the year 2019, the CBI devised the second strategic plan for the years 2021-2023 in which C-ACH has been defined as a system that empowers the participant banks as well as their branches to exchange the clearance transactions in an automatic manner (Mukhif, 2023). Iraq's budget primarily depends on oil revenues while the financial crisis that started in 2015 created a negative impact on, not only the economic growth of the country, but also on the socio-economic-political climate. Some of the reasons attributed to this financial crisis include regulatory imbalance, unchecked expansion of issuing the financial assets, corruption and fraud, and finally, macroeconomic instability (Ghali et al., 2021).

In spite of the challenges faced by the country such as political instability, war and sanctions, the CBI has taken several measures to boost economic growth in the country. Political, legal and economic crises in Iraq complicated the legal and economic frameworks for widespread application of electronic clearance systems in Iraq. In addition to this, low regulatory capacity of the government and political instability play a crucial role in the adoption of electronic clearance systems (Mohammad et al., 2022). However, CBI, following other global nations, started its attempt to develop and follow the electronic payment clearance systems with an aim to get rid of corruption and money laundering issues (Faster Capital, 2024). Electronic banking and electronic clearance systems are highly customized, specialized and complex systems that meet the dynamic consumer demands of the current decade. However, different countries have framed complex economic policies for the incorporation of an e-banking system, especially electronic clearance (Ghasemi et al., 2021). In order to ensure the implementation of electronic clearance systems, the Basel Committee requirements must be met by the respective banks so as to mitigate the risks involved in e-banking services (Hashem & Hamdan, 2018).

Though electronic clearing systems were first introduced in 1967 (AL- Badran, 2021), Iraq started its deployment only in 2006 when the CBI started shifting its payment clearing systems to electronic mode (AL-mamoorey & Al-Rubaye, 2020). A major development occurred in 2007 between a public sector entity (Al-Rafidain & Al-Rasheed banks) and a private sector entity (Iraqi Electronic Payment Systems) for the development of QiCard, a public pension delivery system (Kapita, 2022). Until 2020, 65 banks were active participants in this system, including the National Retirement Authority, Ministry of finance and the Minor's welfare service (Alrubaie, 2020). In Iraq, the C-ACH clearing system (Check Automated Clearing House System) was implemented in 2011 (AL-mamoorey & Al-Rubaye, 2020) and it enables the development of a wholesome database containing the data for all the settlement of electronic instruments and interbank payment orders (Central Bank of Iraq, 2021). In 2021, it was announced by the CBI that the second phase of the wireless project was completed. Table 1 presents an overview of the monetary sector information, obtained from the CBI.

Table 1: Bank clearing information

S. No	Type of transaction	Existing data	Recent data
1	Encoded check's amounts for clearing in IQD	(January 2011) 46.0	(April 2024) 1,407,495.0
2	Encoded check amounts for clearing in USD	(January 2011) 107,297.0	(April 2024) 640,097.0
3	Number of commercial bank check clearing in USD	(August 2004) 114.0	(February 2013) 105.0
4	Number of commercial bank check clearing in IQD	(January 2004) 6,609.0	(September 2013) 21,632.0
5	Number of encoded checks presented for clearing in IQD	(January 2011) 1.0	(April 2024) 13,318.0
6	Number of encoded checks presented for clearing in USD	(January 2011) 8.0	(April 2024) 17.0
7	Volume of check clearing in IQD	(January 2004) 51,069.0	(August 2013) 1,218,518.0
8	Volume of check clearing in USD	(January 2004) 16,550,381.0	(January 2013) 13,856,260.0

Source: Central Bank of Iraq, 2024, https://cbiraq.org/SubCategoriesTable.aspx?SubCatID=96, Accessed: 25.05.2024.

As per the data published by the CBI, in terms of electronic check transfers that occurred in the year 2022, the electronic clearing system (C-ACH) was able to clear (592,994) checks in IQD (Iraqi Dinar) and (2,363) checks in USD (US Dollars). In comparison with the previous year, a record increase (35.8% IQD and 81.2% USD) was observed in terms of transferred amount (Central Bank of Iraq, 2022a).

However, Naeem et al. (2020) mentioned that most of the private banks in Iraq are still following a conventional approach in performing financial transactions instead of adopting digital technologies, as the banks still lack awareness and skills to adopt the digital technologies, a lack of skilled professionals, infrastructure and the commitment from the decision makers. Further, the absence of a sufficient number of ATMs and POS, increasing issues in the issuance of electronic payment cards and the lack of acceptability among the users remain prominent issues that hinder the development and widespread acceptance of the electronic clearance systems (Kapita, 2022).

Various studies have emphasized the importance of electronic clearing system for banks in different countries such as Cameroon (Ndangoh, 2018), Iraq (Hashem & Hamdan, 2018), India (Kaushal & Balaini, 2016), while a few studies from the Middle-East countries such as Iran (Ghasemi et al., 2021), Jordan (Al-Refai & Nawafleh, 2014), Palestine (CCAF, 2021), Nigeria (Anyadighibe et al., 2023) and so on, also provided evidence of the high importance for the acceptance of electronic clearing systems. This is due to the advantages provided by electronic clearing system such as rapid, affordable, additional revenue generation from electronic clearance, flexibility for the consumers, risk mitigation, etc. (Ndangoh, 2018). Though there has been numerous advantages associated with electronic clearance systems, it has its own challenges such as data security and privacy issues, hacking, cyber-attacks, identity theft and so on (Anyadighibe et al., 2023), poor handling of cheques/checks, potential system delays, poor internet connectivity or network availability (Ndangoh, 2018).

In this background, the current study is a first-of-its-kind attempt to compare and contrast two clearing systems i.e., Inter Bank Clearing system (IBCS) and Check Automated Clearing House System (C-ACH) used in Iraqi banking system. The purpose of this study is to analyze the benefits and disadvantages associated with these two clearance systems so as to provide insights to the policy makers for widespread implementation of the best system between the two. Further, the study also aims at analyzing the number of transfers per year, the amount of money transferred through each system.

This way, the current study is a first-of-its-kind attempt to analyze the available data to present novel perspectives on the clearance systems. To the best of the authors' knowledge, no such comparative study has been conducted between the clearance systems in the Iraqi banking system, while only a handful of studies merely dealt with Iraqi banking and electronic clearance systems (AL-mamoorey & Al-Rubaye, 2020; Naeem et al., 2020). The current study also attempts to identify the regulatory frameworks that govern the internal and electronic clearing systems while it also attempts to identify the legal restrictions that prevent the widespread adoption of electronic systems. This comparative study helps in distinguishing the systems

under study in terms of costs, advantages and disadvantages, efficiency, accuracy, timely availability and reachability. The current study is an attempt to fulfil this research gap and the study outcomes would be helpful for the policymakers to amend the legal provisions so as to ease the electronic clearance system for a wider acceptance, which eventually results in rapid and secure transactions that in turn boost economic growth.

Literature review

The current section discusses some of the studies that dealt with the current study theme and the objectives. The section covers studies not only conducted in Iraq and the MENA region (Middle-East and North Africa), but also the studies conducted elsewhere. In the literature (Al-Refai & Nawafleh, 2014), the authors analyzed the impact of inducing Electronic Cheques Clearing (ECC) system at the Central Bank of Jordan. The effectiveness of the system was compared prior to and after the implementation of the ECC system. The value mean of the cheques that were presented for clearance was significantly high in the aftermath of ECC. The study affirms that the electronic clearing system is a valuable and promising alternative to the traditional manual clearance system.

In the literature (Ndangoh, 2018), analyzed the impact of the electronic clearing system upon the debt settlement rate in Afriland First Bank, Cameroon and the study affirmed that the role played by the electronic system was pivotal in settling the debts and correcting the financial differences between the banks. In the context of the UK, the inter-bank payment system corresponds to an arrangement in which the money transfer can be controlled between the participating financial institutions. The working mechanism behind the Interbank Clearing System (IBCS) is to conduct the settlement and liquidation of the financial transactions between the participating banks. There are certain technical rules, procedures and protocols followed for efficient fund transfer and account settlement between the banks (LexisNexis, 2024).

In the case of Saudi Arabia, the payment and settlement methods in the country are exponentially growing compared to the traditional methods due to multiple reasons such as ease, trust in the digital methods, less time for settlements, etc., The average annual growth rate of the electronic clearance system between 2012 and 2021 was 26%. In terms of transactional value too, electronic clearance and settlement methods increased from 2012 to 2021. In spite of the prevalent acceptance of the electronic clearing systems, the study participants still raised questions on data integrity, security and privacy issues. The study further predicted that the conventional clearing methods will decline in the coming years (Ali & Salameh, 2023). According to the report published by the Central Bank of Jordan (Central Bank of Jordan, 2024), though cheques have has a crucial role to play in payment processing, there are serious concerns raised about the technical and security specifications of cheques. In this background, the ACH system was launched in Jordan in the year 2016. The prime objective behind the launch of this system is to execute a high number of money transfers (that are low-valued) so as to increase the banking sector's efficiency.

In addition to this, the country has also started developing the Electronic Clearing Cheques mechanism since 2007 in order to reduce the usage of paper cheques, increase confidence in cheques, mitigate the high volume of returned checques, and create optimum usage of the resources, highly accurate information about the cheques and so on. On the other hand, the customers can get to know the real-time state of their cheques which in turn increases confidence in the system.

According to Ukoh (2023), an automated cheque clearing mobile application was developed by the commercial banks in Nigeria in the year 2017, while the system was viewed as unsuccessful since the transaction values fell compared to the previous year. The authors analyzed the effectiveness of using an automated clearing system on the performance of the banks in the Nigerian banking industry. The study analyzed the impact of ACH upon the liquidity factor and also the loan-to-deposit ratio of the banks that operate in Nigeria. For this study, the researcher collected the secondary data between 1983 and 2020. As per the study outcomes, the automated cheque clearing system negatively impacted the performance of deposit money banks in Nigeria. Though the automation of the cheque clearing process has increased, since the value of cheques got reduced, during the said period, the lending was also reduced.

In the literature Almeshqab et al. (2024), the cheque truncation system followed in Bahrain was investigated in which the study attempted to decode the functioning mechanism and how the electronic clearing system for cheques was implemented in Bahrain through the Bahrain Cheque Truncation System (BCTS). In this system, the relationship between the presenting and the drawee bank is regulatory in nature, with its own operational mechanism. As per the study outcomes, the authors mentioned the need for developing suitable legal provisions and guidelines for the country's electronic checque clearing system. This framework must be a dedicated one, instead of refining the existing laws, opined the authors in this study.

According to the Central Bank of Egypt - Cheques clearing house (Central Bank of Egypt, 2024), the trans-

action values per annum in EGP increased from 553,941,040,452 EGP (in 2009) to 1,127,210,454,883 EGP (in 2024). In the cheque clearing house of the CBE (Central Bank of Egypt), the physical cheques are exchanged between the member banks manually on weekdays. This notion confirms that the country's banking system is yet to progress in terms of digital payment adoption, a strong cash culture, non-acceptance and the lack of technological expertise and awareness, etc.,

The Central Bank of Kuwait (Central Bank of Kuwait, 2024a) has developed the Electronic Banking Services System (EBSS) to ensure that the government entities are able to process their transactions with high accuracy and efficiency with easy traceability. The EBSS offers the participants a way to maintain confidentiality, retrieve historical data and strengthen the system's internal supervision tools. The Kuwait Electronic Cheque Clearing system started its operations in the year 2015 by complying with the international practices (Central Bank of Kuwait, 2024b).

In the literature (Nayla & Al-Taie, 2023), the authors analyzed the impact of electronic payment systems upon savings in Iraq for the period 2011-2019. The study considered two variables such as the amount transferred through ACH and the total settlement on the dependent variable. As per the study outcomes, the total settlement system was negatively correlated with the savings whereas the former was positively correlated with the electronic payment system in both short and long-runs. According to the study outcomes, the total electronic clearing percentage to total deposits stood at 2.3 Million IQD in 2011 and increased to 214.5 million IQD in 2019. The study concluded that in spite of its remarkable expansion, the electronic payment system is still far from complete penetration since the infrastructure is weak to implement such services. Further, lack of awareness, inconsistency in Iraqi laws and regulations, lack of sufficient customer protection laws, no provisions for tax revenues from electronic payment systems, etc., are the challenges to be overcome by the policy makers in the government.

In the literature (Al Mamoory, 2023), the authors aimed at analyzing the role played by electronic payment systems (instant aggregate settlement, electronic clearing and the central depository system) towards the mitigation of complete set of bank-related risks such as liquidity risks, credit risks and the operational risks. This exploratory study was conducted among 80 employees belonging to the payment and risk management departments in Iraqi private banks. The study outcomes confirmed the impact and the existence of a correlation between the application of EPS and the mitigation of bank-related risks.

The impact of the electronic payment system upon the efficiency of Iraqi banks and their performance was analyzed by (Abdel Shafi & Al-Zubaidi, 2020). The study outcomes conclude that the electronic payment systems heavily reduce the costs and save time for the consumers during financial transactions. Further, this novel digital technique also helps in reducing the risks involved in currency trading. The authors suggested that the CBI must enhance the EPS in the country by modernizing the existing technical infrastructure and also strengthen the legal provisions for the end consumers so that their trust in the banks increases. According to the Central Bank of Yemen, the checque is the most prominently used non-cash payment mode in Yemen and so, the role played by the clearing house is too crucial (AlSamawi et al., 2019). The cheques traded through the clearing room were valued at 12.2 Billion YER (936 cheques) during February 2024 while it was 883 cheques worth 14.5 Billion YER in January 2024 (Central Bank of Yemen, 2024).

There is a dearth of studies that compare and contrast the benefits and disadvantages involved in inter-bank clearance and electronic clearing systems pertaining to Iraq. Though the penetration of electronic payment systems is commendable across the globe, there arise specific concerns as well. In this background, the current study attempts to fulfil this research gap and based on the study outcomes, while the study also aims at providing knowledgeable insights about the optimal clearing system for the policymakers.

Research methodology

For the current study, the researcher considered the data available for the period of five years between 2018 and 2022 and the data was sourced from the Central Bank of Iraq (CBI). From the statistical reports published by the CBI and through personal contacts, the data was collected. The number of financial transfers through internal and electronic clearing in dinars and dollars, and the number of transfers for each month and year were sourced from the CBI website in order to determine the trend in both the systems i.e., Inter Bank Clearing System (IBCS) and Check Automated Clearing House System (C-ACH). In the current study, a comparison between the systems (internal clearing and electronic clearing) has been conducted to identify the optimal system. The goal is to find the difference between the systems under consideration. Therefore, the hypotheses were developed to differentiate the number and the amount of transfers between each system in terms of US dollars and Iraqi dinars. Based on the available data, the descriptive statistical analysis was conducted pertaining to the years and the systems.

The following hypotheses were tested in the study:

H_{1a}: There is a difference in the distribution of number of transfers in dollars between the systems

H_{1b}: There is no difference in the distribution of number of transfers in dollars between the systems

H_{2a}: There is a difference in the distribution of banks transfers through checks (dollar) between the systems.

H_{2b}: There is no difference in the distribution of banks transfers through checks (dollar) between the systems.

H_{3a}: There is a difference in the distribution of number of transfers in Iraqi dinars between the systems

H_{3b}: There is no difference in the distribution of number of transfers in Iraqi dinars between the systems

H_{4a}: There is a difference in the distribution of banks transfers through checks (Iraqi dinar) between the systems

H_{4b}: There is no difference in the distribution of banks transfers through checks (Iraqi dinar) between the systems

The following analyses were conducted in the manuscript for which the formula are given for each test.

Kolmogorov-Smirnov (K-S) test is conducted on the basis of the empirical distribution function (ECDF). Given the N ordered data points Y_1, Y_2, ..., YN, the ECDF is defined as:

$$E_N = \frac{n(i)}{N} \tag{1}$$

Here, n(i) corresponds to the number of points less than Y_i and the Y_i are ordered from the smallest to largest value. This is a step function that increases by 1/N at the value of each ordered data point.

The Shapiro–Wilk test analyzes the null hypothesis that a sample x_1, ..., x_n came from a normally-distributed population. The test statistic is as follows.

$$W = \frac{(\sum_{i=1}^{n} \alpha_i x_{(i)})^2}{\sum_{i=1}^{n} (x_i - \bar{x})^2} \tag{2}$$

Here, x_i with the parentheses enclosing the subscript index i is the i^{th} order statistic, i.e., the i^{th}-smallest number in the sample (not to be confused with x_i). $\bar{x} = (x_1 + \ldots + x_n)/n$ is the sample mean.

For the Mann-Whitney U statistic, if the sample sizes are equal (T_1 and T_2 are the samples), then the test statistic is as follows.

$$T = \min(T_1, T_2) \tag{3}$$

In the case of unequal sample sizes, T1 is the sum of the smaller sample size and the test statistic is as follows,

$$T = MIN\left(T_1, N_1 * \left(N_1 + N_2 + 1\right) - T_1\right) \tag{4}$$

Table 2 shows the data for the Inter Bank Clearing System in Iraqi dinars and US dollars for five consecutive years. It can be observed that the Inter Bank Clearing System operations have increased constantly in terms of financial amounts, whether in dinars or dollars. This phenomenon indicates the existence of active banking movement. Figure 1 shows the internal clearing operations in Iraqi dinars with highs and lows. But, the highest number of transactions occurred in 2019. Figure 2 shows the highest level of the Inter Bank Clearing System in dollars was in 2019, especially in the months of March and August.

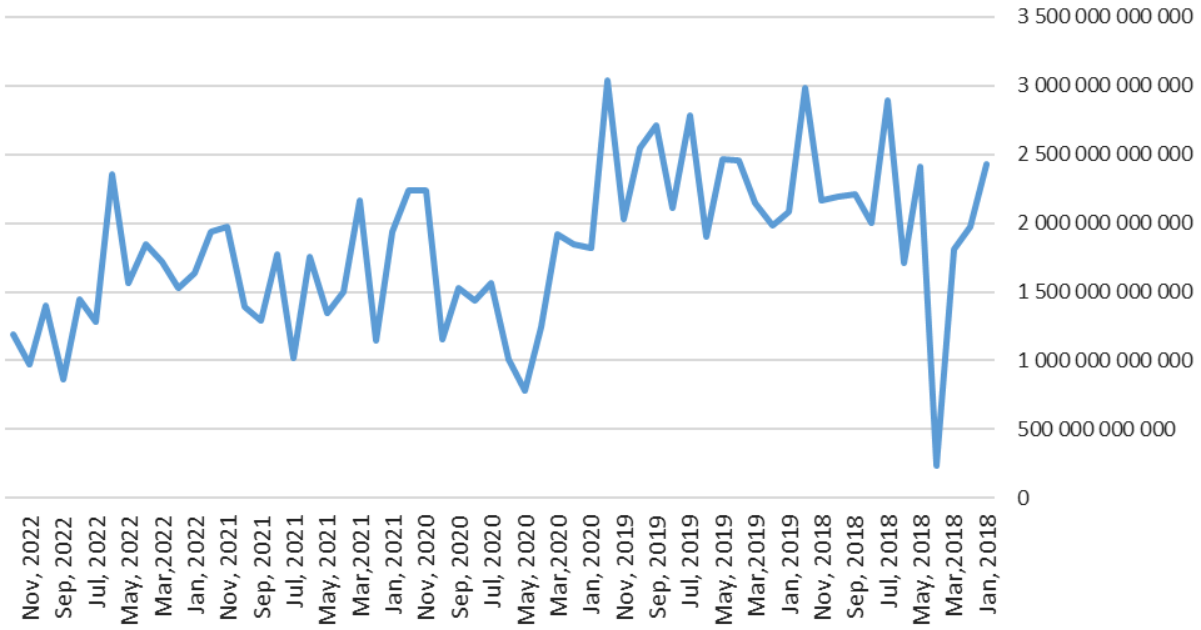
Table 2: Inter Bank Clearing System in Iraqi dinars and US dollars

Year	Number of transfers in dollars	Bank transfers through the internal clearing system (ON-US) (dollars)	Number of transfers in Iraqi dinars	Bank transfers through the internal clearing system (ON-US) (Iraqi dinars)
Jan, 2018	2	7,286,327	52,831	2,426,110,843,342
Feb, 2018	51	5,148,863	48,478	1,976,589,075,025
Mar, 2018	1	287,262	48,212	1,809,925,412,669
Apr, 2018	3	296,350	54,816	231,902,458,367
May, 2018	5	1,095,013	57,362	2,413,969,013,775
Jun, 2018	2	714,107	43,866	1,707,628,898,086
Jul, 2018	6	1,294,403	70,792	2,889,965,821,760
Aug, 2018	1	500,000	58,797	1,996,884,570,775
Sep, 2018	3	627,705	58,916	2,210,063,224,655
Oct, 2018	1	10,000	52,118	2,189,076,640,210
Nov, 2018	5	3,113,872	62,778	2,169,791,243,569
Dec, 2018	3	882,433	64,038	2,981,303,512,439
Jan, 2019	8	937,844	51,448	2,084,611,174,426
Feb, 2019	3	2,340,166	53,169	1,983,908,186,321
Mar,2019	0	0	54,132	2,145,704,876,932
Apr, 2019	2	422,798	54,388	2,455,004,430,210

Year	Number of transfers in dollars	Bank transfers through the internal clearing system (ON-US) (dollars)	Number of transfers in Iraqi dinars	Bank transfers through the internal clearing system (ON-US) (Iraqi dinars)
May, 2019	7	100,700,930	53,195	2,462,657,875,478
Jun, 2019	9	597,826	45,832	1,903,654,878,962
Jul, 2019	2	41,335.41	62,442	2,788,190,257,997
Aug, 2019	2	100,355,759	42,331	2,106,490,624,295
Sep, 2019	2	25,104	62,038	2,715,428,768,577
Oct, 2019	1	25,000	53,413	2,550,553,272,080
Nov, 2019	4	1,706,153	42,799	2,032,235,525,473
Dec, 2019	5	337,341	52,996	3,037,970,950,835
Jan, 2020	3	7,101,360	41,821	1,823,628,347,366
Feb, 2020	5	581,405	47,652	1,848,070,257,937
Mar, 2020	5	494,132	28,244	1,917,969,385,558
Apr, 2020	4	880,823	20,147	1,245,018,680,324
May, 2020	4	613,927	26,652	779,670,910,274
Jun, 2020	0	0	19,098	1,005,050,945,776
Jul, 2020	7	1,087,608	28,136	1,564,348,580,873
Aug, 2020	2	688,000	28,972	1,437,766,375,592
Sep, 2020	3	391,831	44,840	1,532,038,905,130
Oct, 2020	0	0	36,898	1,157,931,649,570
Nov, 2020	2	600,000	43,741	2,241,128,223,583
Dec, 2020	2	80,000	45,913	2,240,441,234,248
Jan, 2021	14	275,168	40,956	1,941,290,585,550
Feb, 2021	8	342,337	36,491	1,147,910,607,636
Mar, 2021	2	305,009	36,813	2,163,969,698,301
Apr, 2021	6	3,168,662	42,141	1,504,076,445,890
May, 2021	3	765,026	26,386	1,345,386,448,740
Jun, 2021	1	1,470,996	45,433	1,753,718,893,493
Jul, 2021	4	328,500	24,116	1,013,734,921,549
Aug, 2021	2	2,792,186	43,391	1,773,457,966,158
Sep, 2021	1	2,362,714	44,107	1,294,378,580,110
Oct, 2021	1	50,000	36,700	1,389,444,624,885
Nov, 2021	3	79,476	50,965	1,978,085,782,247
Dec, 2021	4	4,391,989	45,005	1,936,995,503,772
Jan, 2022	4	3,033,433	40,006	1,638,627,784,948
Feb, 2022	3	4,627,122	40,351	1,531,772,972,492
Mar, 2022	2	71,000	42,279	1,717,541,981,206
Apr, 2022	1	10,000	42,037	1,848,310,469,248
May, 2022	1	75,000	31,974	1,562,602,321,101
Jun, 2022	3	7,374,567	48,837	2,356,577,882,184
Jul, 2022	0	0	28,979	1,283,626,160,348
Aug, 2022	2	7,232,579	50,107	1,443,370,840,928
Sep, 2022	1	5,000	40,406	864,404,054,088
Oct, 2022	0	0	48,220	1,401,612,540,031
Nov, 2022	0	0	50,637	975,003,099,062
Dec, 2022	6	313,242	39,870	1,194,935,223,140

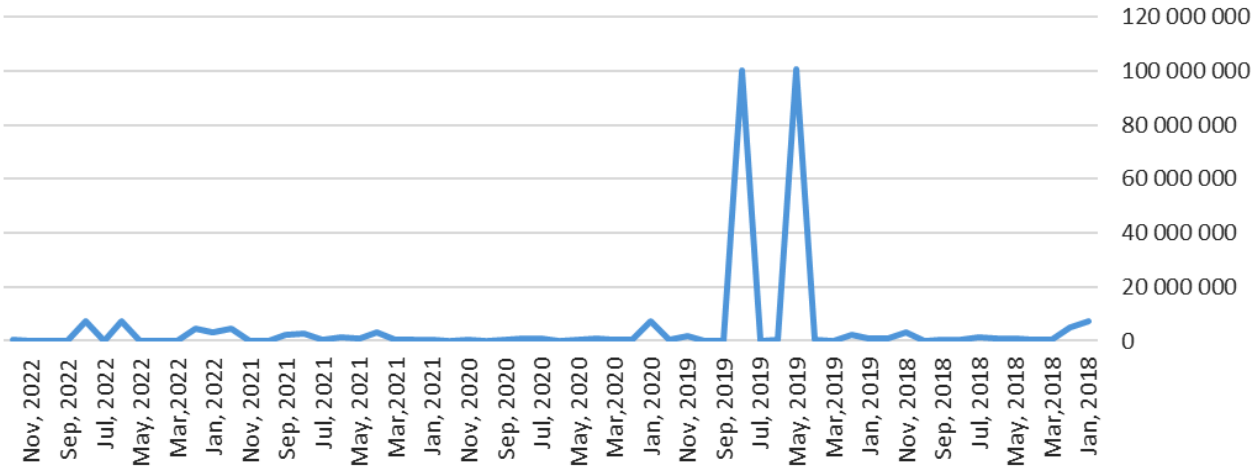
Source: Central Bank of Iraq, 2024; Central Bank of Iraq, 2018; Central Bank of Iraq, 2019b; Central Bank of Iraq, 2020b; Central Bank of Iraq, 2021; Central Bank of Iraq, 2022b.

Figure 1: Bank transfers through the internal clearing system (ON-US) (Iraqi dinars)



Source: Author's own work.

Figure 2: Bank transfers through the internal clearing system (ON-US) (dollars)



Source: Author's own work.

Table 3 shows the data for the Check Automated Clearing House System in Iraqi dinars and dollars for the study period. It can be understood from the data that the electronic clearing operations in dollars and Iraqi dinars increased over this period of time. The majority of the C-ACH operations in Iraqi dinars and the maximum transactions were in September 2019. In terms of US dollars, they were high in the year 2020, especially February. However, there was a drastic decline observed in this phenomenon later as shown in Figure 4.

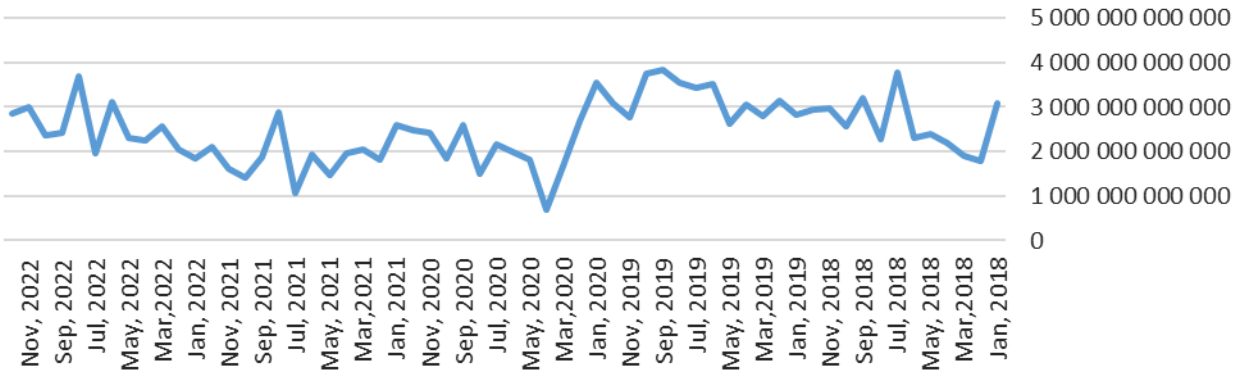
Table 3: Check Automated Clearing House System in Iraqi dinars and US dollars

Year	Number of transfers in dollars	Banks transfers through check - automated clearing house (c-ach) (dollar)	Number of transfers in Iraqi dinars	Banks transfers through check - automated clearing house (c-ach) (Iraqi dinar)
Jan, 2018	191	116,413,672	42,716	3,094,858,474,967
Feb, 2018	173	85,203,083	39,438	1,772,479,285,975
Mar,2018	155	116,491,707	42,434	1,888,050,237,716
Apr, 2018	169	17,411,369	48,013	2,180,762,538,214
May, 2018	185	52,461,526	47,074	2,395,629,536,392
Jun, 2018	138	16,921,069	38,070	2,305,951,520,808
Jul, 2018	198	15,052,040	61,531	3,763,586,013,762
Aug, 2018	181	22,216,997	54,373	2,290,108,965,797
Sep, 2018	136	23,079,252	59,190	3,198,228,054,286
Oct, 2018	186	41,605,990	60,571	2,573,461,006,196
Nov, 2018	146	15,851,721	58,224	2,957,569,233,381
Dec, 2018	181	26,870,446	56,869	2,940,518,869,282
Jan, 2019	173	20,021,574	65,582	2,818,375,992,608
Feb, 2019	199	21,495,257	65,839	3,140,402,685,163
Mar,2019	185	14,001,814	65,960	2,807,494,682,419
Apr, 2019	204	14,711,892	64,282	3,059,025,257,853
May, 2019	241	15,466,277	72,575	2,614,001,105,597
Jun, 2019	179	55,783,005	58,482	3,504,390,250,123
Jul, 2019	198	12,135,143	80,499	3,428,853,519,520
Aug, 2019	182	13,244,355	6,384	3,546,467,930,161
Sep, 2019	242	14,659,524	79,965	3,825,221,373,661
Oct, 2019	203	16,203,711	64,351	3,747,188,554,950
Nov, 2019	188	18,661,293	47,286	2,771,948,074,635
Dec, 2019	343	24,068,890	69,568	3,093,533,116,384
Jan, 2020	314	20,112,172	53,382	3,538,112,341,694
Feb, 2020	274	121,343,834	67,920	2,669,711,921,850
Mar, 2020	130	6,792,493	34,247	1,672,832,973,324
Apr, 2020	52	10,175,019	8,872	680,549,358,674
May, 2020	179	20,098,233	32,381	1,802,470,305,301
Jun, 2020	132	6,901,670	17,524	1,976,957,294,119
Jul, 2020	237	26,816,298	28,124	2,146,617,699,191
Aug, 2020	148	11,698,964	31,119	1,484,464,828,015
Sep, 2020	137	6,647,790	47,066	2,587,330,272,213
Oct, 2020	124	9,510,790.84	43,726	1,835,485,274,892
Nov, 2020	161	20,216,343	48,050	2,411,445,508,905
Dec, 2020	168	18,109,725	52,054	2,467,482,321,129
Jan, 2021	131	12,262,747	47,624	2,591,603,979,974
Feb, 2021	140	11,235,895	41,868	1,817,918,417,344
Mar, 2021	136	22,818,538	41,559	2,047,018,622,771
Apr, 2021	135	12,708,192	45,947	1,959,229,824,851
May, 2021	87	5,775,933	33,471	1,478,783,435,344
Jun, 2021	148	49,192,398	62,781	1,940,588,487,275
Jul, 2021	73	19,894,281	37,032	1,068,549,592,792
Aug, 2021	130	28,017,358	57,759	2,879,103,501,005
Sep, 2021	122	18,423,484	52,529	1,875,499,838,828
Oct, 2021	122	8,412,171	41,884	1,421,149,124,434
Nov, 2021	114	6,476,339.56	62,512	1,624,412,476,324

Year	Number of transfers in dollars	Banks transfers through check - automated clearing house (c-ach) (dollar)	Number of transfers in Iraqi dinars	Banks transfers through check - automated clearing house (c-ach) (Iraqi dinar)
Dec, 2021	143	35,802,395	57,239	2,089,853,663,036
Jan, 2022	105	8,033,424	48,181	1,833,234,476,776
Feb, 2022	84	11,294,038	49,692	2,033,193,619,781
Mar, 2022	119	14,401,047	52,382	2,566,960,933,773
Apr, 2022	119	20,673,327	51,997	2,233,438,687,649
May, 2022	91	5,414,870	39,555	2,297,236,848,644
Jun, 2022	404	14,046,522	58,110	3,103,083,090,579
Jul, 2022	363	46,198,338	37,939	1,948,814,154,395
Aug, 2022	158	30,748,905	57,433	3,683,881,250,450
Sep, 2022	148	16,570,145	46,533	2,410,842,867,957
Oct, 2022	174	13,141,516	54,112	2,362,722,252,385
Nov, 2022	1,623	23,593,230	51,653	3,010,741,245,956
Dec, 2022	436	21,742,523	45,407	2,856,435,646,625

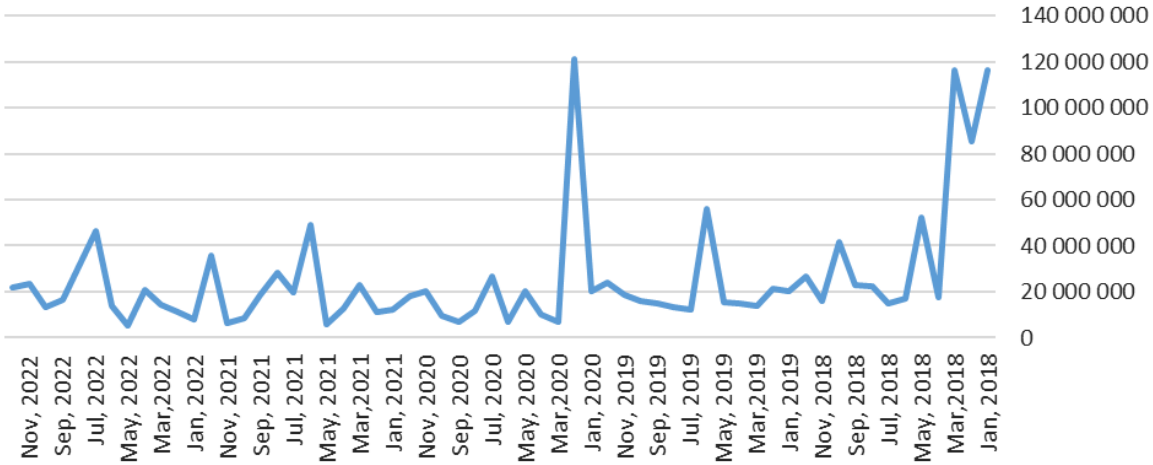
Source: Central Bank of Iraq, 2024.

Figure 3: Banks Transfers through Check - Automated Clearing House (C-ACH) (Iraqi dinar)



Source: Author's own work.

Figure 4: Banks Transfers through Check - Automated Clearing House (C-ACH) (dollar)



Source: Author's own work.

Results

The current section presents the data analysis and the study findings. The secondary data sourced from the CBI was analyzed using Statistical Package for Social Sciences (SPSS V.28) for both descriptive and inferential statistics. The first subsection presents the descriptive statistics analysis for the selected variables while the second subsection discusses some of the bivariate correlations identified in the study. The third subsection details the hypothesis testing through an independent sample Mann-Whitney U test and t-test.

Descriptive statistics

Table 4 shows the descriptive statistical outcomes in terms of mean (M) and standard deviation (SD) for the selected variables.

Table 4: Descriptive statistics for the study period

Year		Number of transfers in dollars	Banks Transfers through Check (dollar)	Number of transfers in Iraqi dinars	Banks Transfers through Check (Iraqi dinar)
2018	N	24.000	24.00	24.00	24.00
	Mean	88.420	23,784,800.29	53,396.13	2,348,517,268,810.33
	SD	85.084	35,014,256.15	8,458.48	687,028,075,069.13
2019	N	24.000	24.00	24.00	24.00
	Mean	107.580	18,664,291.31	57,039.83	2,775,971,390,194.17
	SD	110.938	28,142,014.29	15,004.71	572,061,086,910.22
2020	N	24.000	24.00	24.00	24.00
	Mean	87.210	12,122,600.80	36,524.13	1,836,105,149,814.08
	SD	99.288	24,658,289.60	13,643.59	651,561,638,564.80
2021	N	24.000	24.00	24.00	24.00
	Mean	63.750	10,306,324.77	43,946.21	1,751,506,709,262.87
	SD	62.976	12,893,086.62	9,903.07	452,579,443,507.40
2022	N	24.000	24.00	24.00	24.00
	Mean	160.290	10,358,326.17	45,695.71	2,006,623,766,822.75
	SD	338.441	11,744,118.17	7,457.67	708,426,287,523.34
Total	N	120.000	120.00	120.00	120.00
	Mean	101.450	15,047,268.67	47,320.40	2,143,744,856,980.84
	SD	172.209	24,393,877.74	13,261.18	718,400,209,220.23

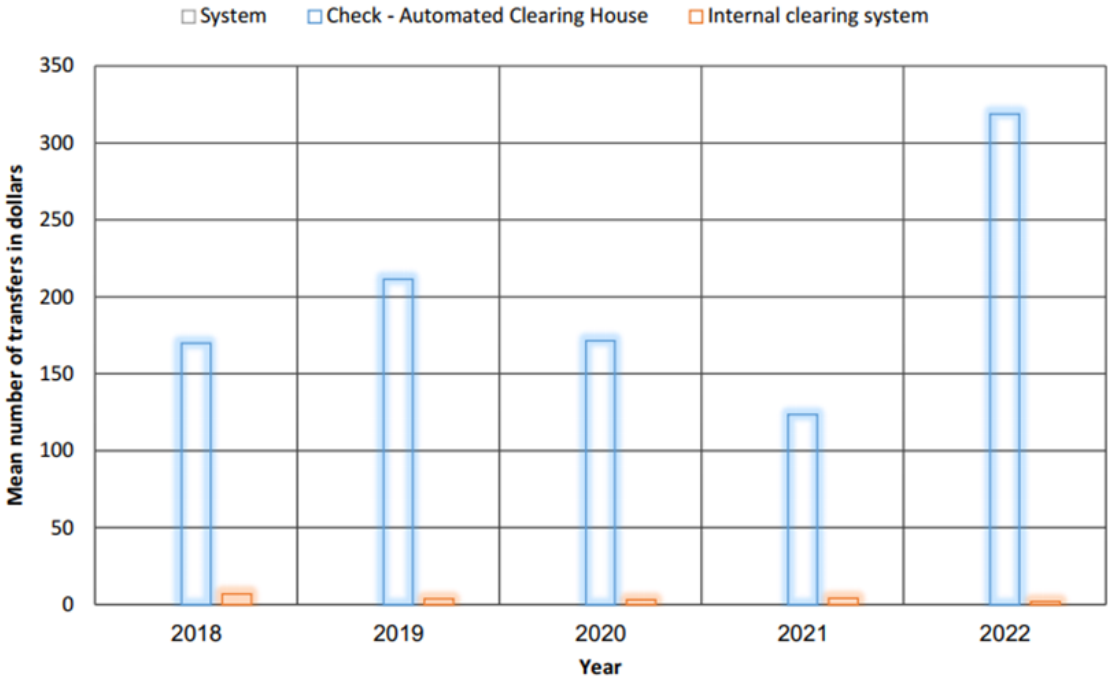
Source: Author's own work.

Table 5: Descriptive statistics for IBCS and C-ACH

System		Number of transfers in dollars	Banks Transfers through Check (dollar)	Number of transfers in Iraqi dinars	Banks Transfers through Check (Iraqi dinar)
Check - Automated Clearing House	N	60.00	60.00	60.00	60.00
	Mean	198.95	25,422,209.27	49,815.67	2,468,764,373,635.08
	SD	201.08	25,595,165.15	14,714.10	704,342,337,382.79
Internal clearing system	N	60.00	60.00	60.00	60.00
	Mean	3.95	4,672,328.07	44,825.13	1,818,725,340,326.60
	SD	6.70	18,060,129.28	11,204.00	574,448,187,718.53
Total	N	120.00	120.00	120.00	120.00
	Mean	101.45	15,047,268.67	47,320.40	2,143,744,856,980.84
	SD	172.21	24,393,877.74	13,261.18	718,400,209,220.23

Source: Author's own work.

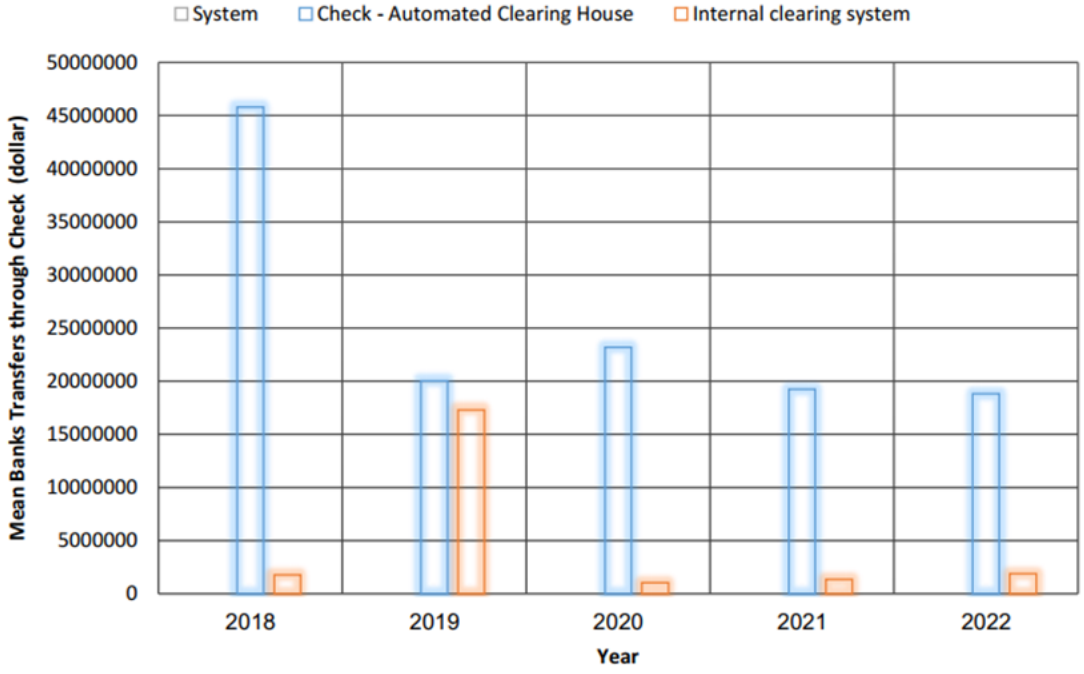
Figure 5: Distribution in terms of number of transfers (in dollars)



Source: Author's own work.

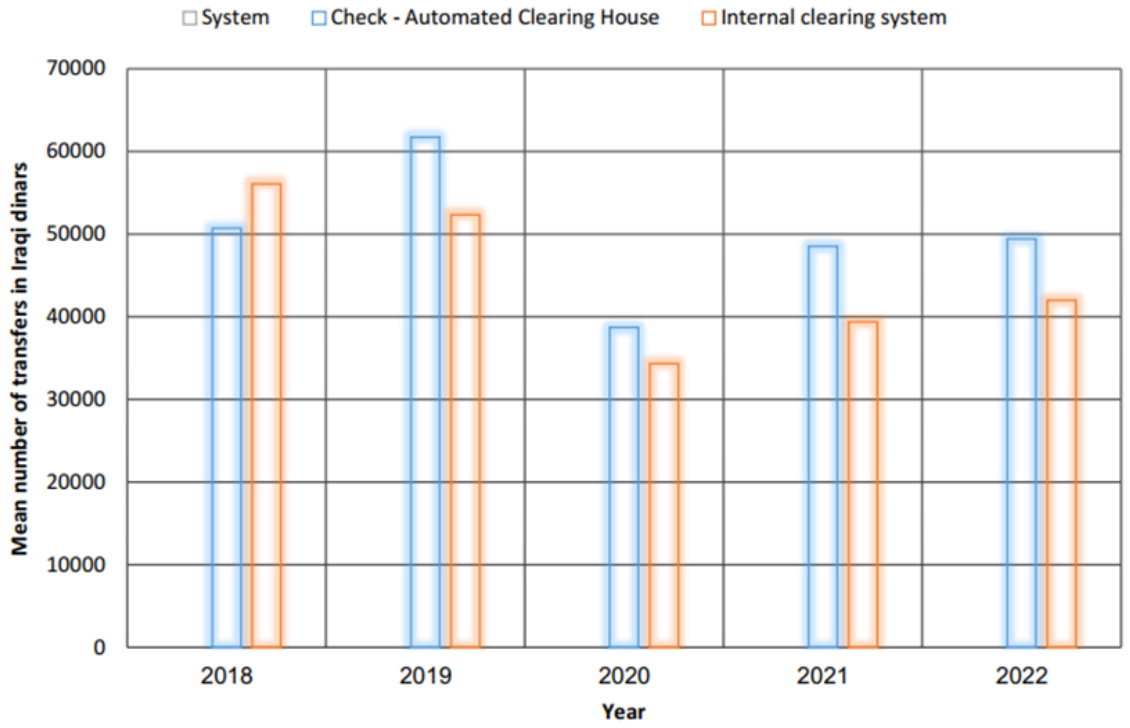
Tables 4-5 and Figures 5-8 show the variations in the selected variables across the study period. The results also confirmed the presence of a difference between the systems under study whereas the C-ACH system outcomes are significant enough to be considered.

Figure 6: Distribution of banks transfers through checks (in dollars)



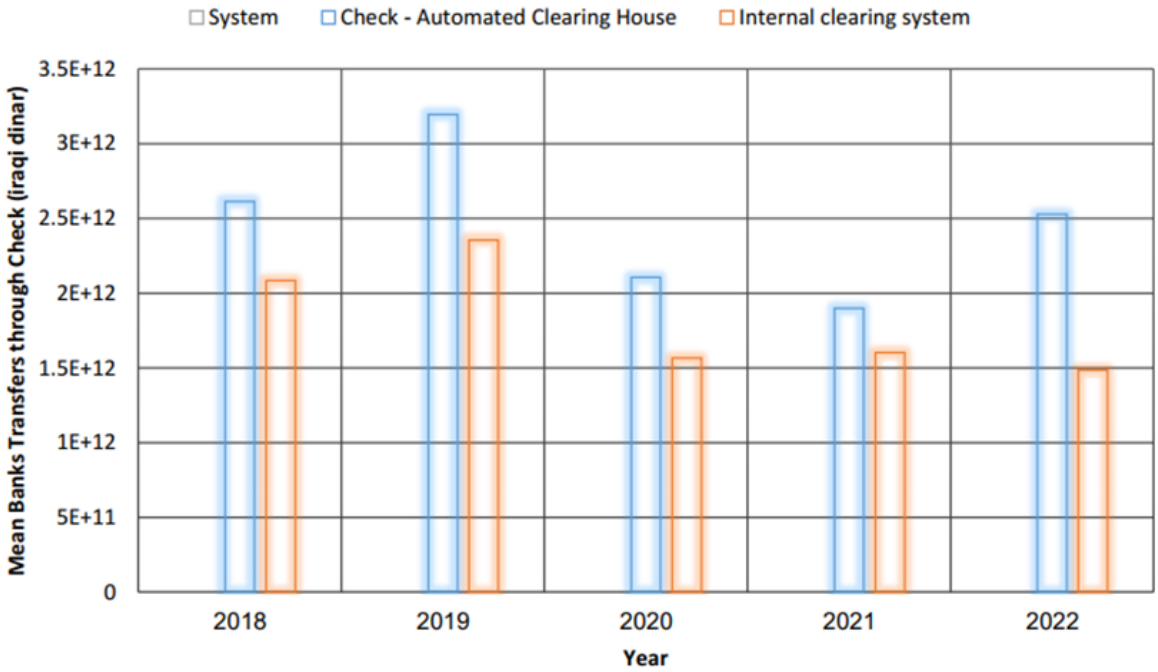
Source: Author's own work.

Figure 7: Distribution of number of transfers (in Iraqi dinars)



Source: Author's own work.

Figure 8: Distribution of banks transfers through checks (in Iraqi dinars)



Source: Author's own work.

Correlation analysis

In order to assess the relationship between the variables, Pearson's correlation (r) was conducted in this study. In general, Pearson's correlation is conducted to verify the intensity of the existing linear association between the variables, and it measures the linear association between quantitative variables.

Table 6: Pearson correlation matrix

		Number of transfers in dollars	Banks Transfers through checks (dollar)	Number of transfers in Iraqi dinars	Banks Transfers through checks (Iraqi dinar)
Number of transfers in dollars	Correlation	--			
Banks Transfers through checks (dollar)	Correlation	0.284**	--		
	P-value	0.002			
Number of transfers in Iraqi dinars	Correlation	0.188*	0.144	--	
	P-value	0.039	0.116		
Banks Transfers through checks (Iraqi dinar)	Correlation	0.413***	0.276**	0.604***	--
	P-value	0.000	0.002	0.000	

Source: Author's own work.

Here, the coefficient is a number between -1 and 1, which corresponds to the degree of linear dependence between the quantitative variables. If the value is negative, then it indicates that one variable decreases as the other increases; if positive, then one variable increases as the other increases. The r values are distributed as follows: r = 0–0.3, low correlation; r = 0.3–0.7, moderate correlation; r = 0.7–1, high or strong correlation. Table 6 shows the outcomes from the Pearson's correlation analysis among all the variables. As per the outcomes, the 'number of transfers in dollars' has a significantly weak relationship with 'Banks Transfers through checks in dollars' ($r(120 = 0.284, P > 0.01)$) and 'number of transfers in Iraqi dinars' ($r(120 = 0.188, P > 0.05)$). On the other hand, there exists a significant moderate relationship with 'Banks Transfers through Checks in Iraqi dinar' ($r(120 = 0.413, P > 0.001)$). In addition to this, the variable 'Banks Transfers through Checks in Iraqi dinar' has a significantly weak relationship with 'Banks Transfers through Checks in dollars' ($r(120 = 0.276, P > 0.01)$), and a significant and moderate relationship with the 'number of transfers in Iraqi dinars' ($r(120 = 0.604, P > 0.001)$).

Hypothesis testing

The current section discusses the analytical outcomes from comparison of the differences in the systems. To choose between parametric and nonparametric tests, the normal distribution test was conducted using Kolmogorov-Smirnov and Shapiro-Wilk tests and the outcomes are shown in Table 7.

Table 7: Normality tests

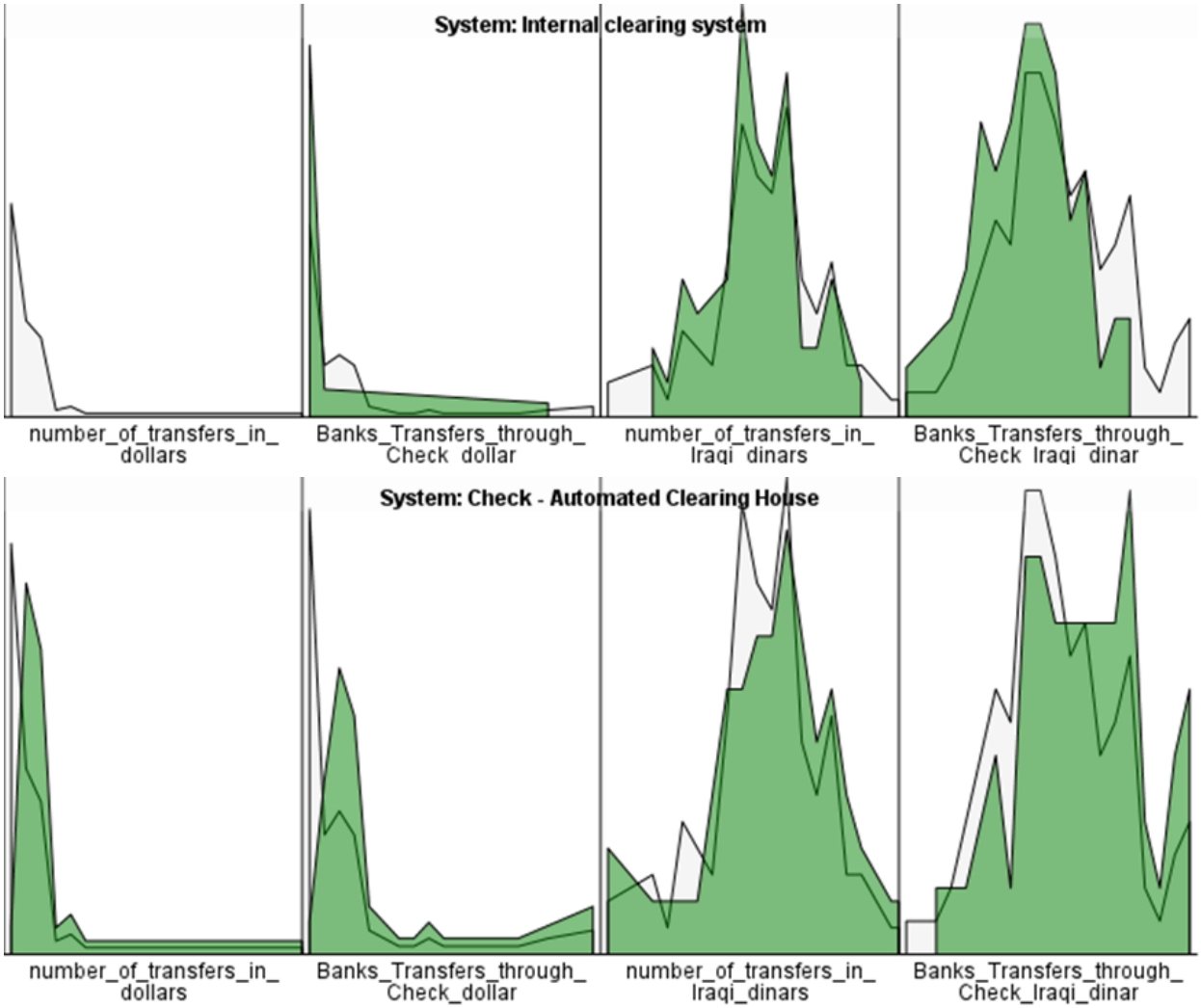
Variables	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	P-value	Statistic	df	Sig.
Number of transfers in dollars	0.278	120	0.000	0.504	120	0.000
Banks Transfers through checks (dollar)	0.269	120	0.000	0.612	120	0.000
Number of transfers in Iraqi dinars	0.068	120	0.200**	0.986	120	0.266
Banks Transfers through checks (Iraqi dinar)	0.056	120	0.200**	0.990	120	0.549

Source: Author's own work.

The analytical outcomes indicate that both the 'number of transfers in dollars' and 'bank transfers through checks in dollars' were not normally distributed since the P-value is less than 0.05. So, the non-parametric tests would be appropriate in this regard. Since we have two systems i.e., a categorical variable with two independent categories, independent-samples Mann-Whitney U Test is the appropriate choice for the non-parametric test. The results also indicate that both the 'number of transfers in Iraqi di-

nars' and 'banks transfers through checks in Iraqi dinar' were normally distributed since the P-value is above 0.05. This finding confirms the parametric tests to be an appropriate choice for these variables. Independent-samples t-Test is the suitable parametric test due to the presence of two systems.

Figure 9: Distribution of the variables between the systems



Source: Author's own work.

Figures 9 and 10 show the distributions of the selected variables. The figure infers that the Check-Automated Clearing House processed a large number in volumes and values compared to the IBCS in all the variables under study. Table 8 shows the outcomes for the hypothesis testing.

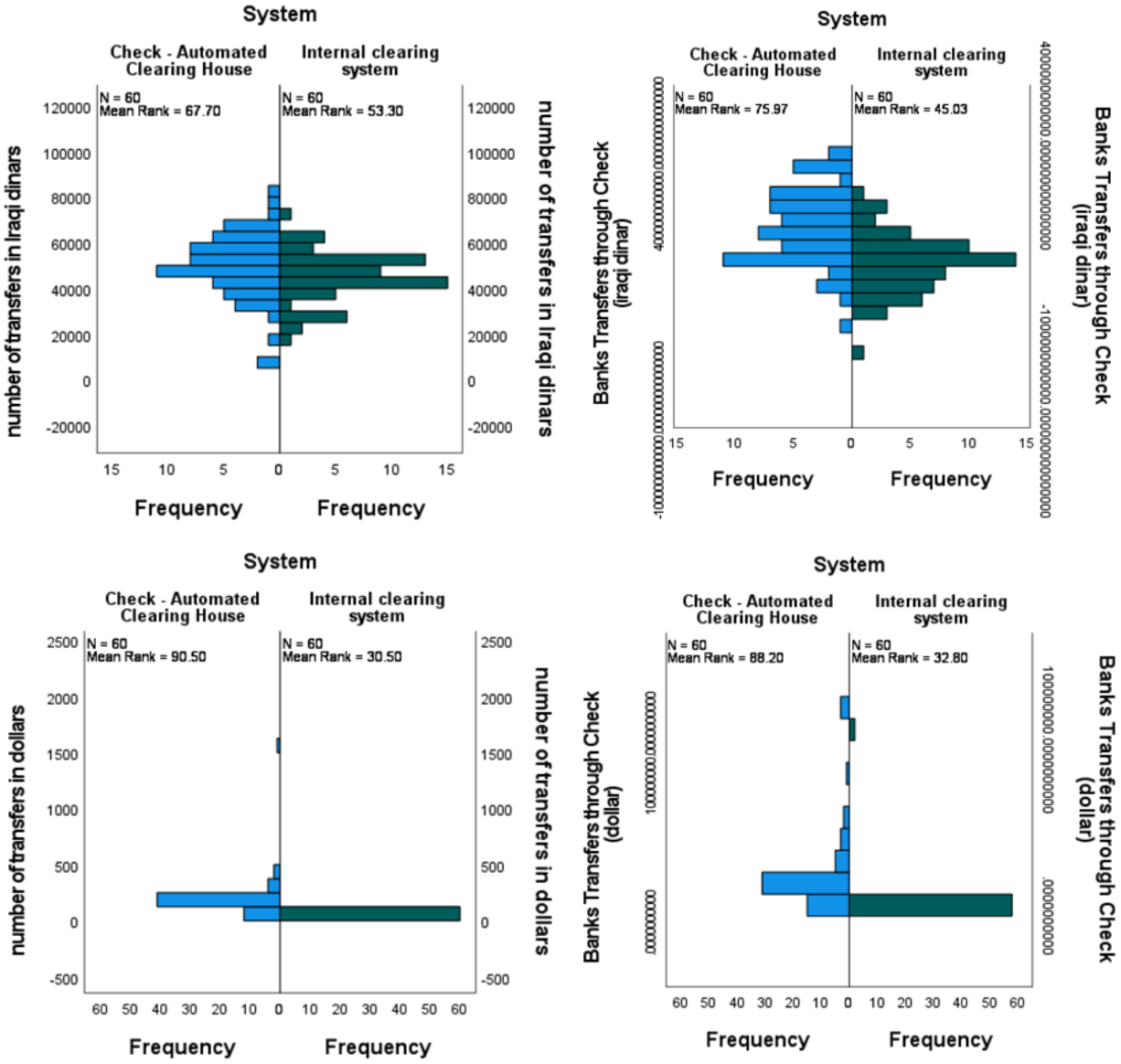
Table 8: Hypothesis testing

No.	Null Hypothesis	Test	Standardized Test Statistic	P-value	Decision
H_{1b}	There is no difference in the distribution of number of transfers in dollars between the systems	Independent-Samples Mann-Whitney U Test	-9.461	0.000	Reject the null hypothesis
H_{2b}	There is no difference in the distribution of banks transfers through checks (dollar) between the systems.	Independent-Samples Mann-Whitney U Test	-8.724	0.000	Reject the null hypothesis

No.	Null Hypothesis	Test	Standardized Test Statistic	P-value	Decision
H_{3b}	There is no difference in the distribution of number of transfers in Iraqi dinars between the systems	Independent-Samples t-Test	-2.090	0.019	Reject the null hypothesis
H_{4b}	There is no difference in the distribution of banks transfers through checks (Iraqi dinar) between the systems.	Independent-Samples t-Test	-5.540	0.000	Reject the null hypothesis

Source: Author's own work.

Figure 10: Mean ranks for the selected variables across the different systems



Source: Author's own work.

The independent-sample Mann-Whitney U test outcomes confirm the presence of a significant difference between C-ACH and IBCS in both the number of transfers in dollars and banks transfers through checks in dollars, since the p-value is less than 0.05. The independent-sample T-test outcomes confirm the presence of a significant difference in terms of 'number of transfers in Iraqi dinars' ($t = -2.090$, $P < 0.05$) and 'banks transfers through checks in Iraqi dinar' ($t = -5.540$, $P < 0.001$), since the p-value is less than 0.05. From the data analysis, it is clear that there exists a significant difference between the systems' performance in terms of number of transfers in dollars and Iraqi dinars as well as the distribution of bank transfers through checks in dollars and Iraqi dinars. Between the systems (IBCS and C-ACH) under study, the C-ACH system gains prominence with the highest number of transfers and the distribution of bank transfers through checks. In terms of outcomes from the correlation analysis, the number of transfers in dollars has a significantly weak relationship with the bank transfers through checks in dollars. This outcome infers that the customers prefer to transact dollars mostly through other modes of payment instead of using checks. Likewise, the bank transfers through checks in Iraqi dinar has a significant moderate relationship with the number of transfers in Iraqi dinars. This outcome as well infers that the customers prefer check transactions mostly in Iraqi dinar with a high number of transfers. With regards to hypothesis testing from the Mann Whitney U test and independent sample T-test, all the null hypotheses were rejected.

Discussion

Banking clearing systems have evolved across the globe while keeping in mind the operations and the target audience of the banking systems in their respective countries. Though electronic clearing systems have been adopted in many countries so far as discussed in the literature review section, the interbank clearing system is still in use in Iraq. As per the current study outcomes, the study hypotheses have been fulfilled and the null hypotheses were rejected. This finding infers that the banking system and the customers preference have already started moving towards an electronic clearing system in Iraq. The e-payment service providers must automate their processes in alignment with the quality standards so as to get rid of intrusions and malicious attacks (Kapita, 2022). Various advantages are associated with C-ACH as discussed earlier (Ndangoh, 2018) such as robust economic development, efficient and rapid clearing time, cost savings for the consumer, enhanced security and convenience for the bankers, and the status of being regulatory compliant and finally, eco-friendly. In spite of these, as mentioned by Anyadighibe et al. (2023), electronic clearing systems have their own limitations to overcome. In spite of the advantages discussed earlier, the C-ACH still has a few limitations to be addressed such as the possibility of errors, limited international transaction usage, transaction fees, no real-time confirmation and the continuous evolution of the system. According to Trivedi and Sanchiher (2023), these challenges must be overcome so that the C-ACH can be applied extensively.

According to Loza (2017), the modernization of the payment system is not only confined to task allocation to the central bank and the respective financial system, but also various stakeholders involved in the economy. With the implementation of the electronic clearing system, there comes the issue of ownership, whether it should be with the central bank or with the private players. In the case of the Peruvian banking system, the author detailed how discriminative it would be, if the country has banks that are too large and banks that are too small and how it is challenging for the system to be applied in both these cases.

In the case of India, the Reserve Bank of India started automating the clearing systems i.e., electronic clearing services in the 1980s while the RTGS was introduced in 2004 and NEFT in 2005 with the incorporation of the National Electronic Clearing Services (NECS) system. One study (Abid, 2016) mentioned that the lack of awareness, hesitation to adopt evolving banking technologies, lack of high-speed internet connectivity, fear of taxation due to entry into formal banking system, lack of technology infrastructure and cash being the preferred mode of payment are the hindrances that pose challenges towards the adoption of the electronic clearing system.

The Central Bank of Iraq must devise strategies to develop a robust electronic clearing system so that the participant banks can efficiently process the transactions within a record time. This way, the customers can feel relieved and secure about their transactions and also get updates on a timely basis. The current study found that the number of transfers that occurred through the electronic banking system has increased drastically in recent years. However, the challenge in terms of lack of technical infrastructure to meet the increasing customer demands must be addressed. On the other hand, there is a lack of data pertaining to the costs incurred upon both the clearing systems from the CBI. So, the CBI must be able to publish certain data pertaining to the performance of these two systems. This way, it can be a frontrunner in ensuring openness, transparency, integrity and reliability upon the banking system in Iraq. There is a dearth of data pertaining to creating awareness and empowering bank employees, customers and all other stakeholders involved in the

banking system about the importance of shifting from the traditional interbank clearing system to the electronic clearing system. Though the CBI has conducted courses regarding the electronic clearing systems in the previous years (Central Bank of Iraq, 2020a), it is important for bank employees to get updates now and then, as the technology evolves. Especially, in the aftermath of COVID-19, physically visiting a bank for financial transactions should be preferred as the final option since it helps the customers to save time, energy and safeguard themselves.

Though the electronic clearing systems have been successful in most countries, as discussed in the literature, the Iraqi banking system has its own requirements due to the existing payment methods. A few factors still favor the continuance of internal clearing systems, especially in the case of specific institutions or niche use cases. So, the decision makers should take a holistic view of the customers' requirements and develop policy level recommendations for bringing robust economic growth in the country.

Every research study has its own limitations. The current study has a few limitations to be overcome in the future studies. There is a lack of sufficient data from the CBI with regards to costs incurred upon the payment clearance systems, regulatory frameworks that govern the internal and electronic clearing systems and the legal restrictions that prevent the widespread adoption of electronic systems. The current study findings recommend that the policymakers ensure data availability, transparency and integrity so that the future studies can analyze the available information and provide knowledgeable insights. This study provides a valuable contribution to the country's research works, pertaining to the clearing systems in Iraq.

Conclusion

The aim of this study is to compare and contrast the IBCS and C-ACH under various metrics and the study outcomes established the prominence and superiority of the electronic clearing system in Iraqi banking operations. The current study provides knowledgeable insights about the systems' performance since there is a research gap in this domain. Though the current study has its own limitations, future studies can focus on addressing these drawbacks so that the decision makers can be provided with reliable and updated information. It can be concluded that the current study objectives have been fulfilled and it functions as a valuable contribution to this research domain in Iraq.

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