

Burden of Cash Economy in India: A Statistical Analysis

Sathyanarayana

Assistant Professor of Economics (Senior Scale)

Department of Economics

B M Shetty Government First Grade College

Konanur, Arakalagudu Taluk, Hassan

Karnataka, India – 573130

sathya956@gmail.com

Abstract

Physical form of money has a uniquely ubiquitous role in daily life. The economy requires a certain amount of cash to functions. But, the excess amount of cash in circulation brings a lot of problems to an economy. Hence, the mission of the Indian government is to move towards digital economy to reduce burden of cash economy. This paper is solely based on data from the Reserve Bank of India (RBI), it offered a comprehensive and authoritative perspective on the cash economy in India. The RBI, being the central bank of the country, is a key source for economic and financial data. The issues like trends in circulation of banknotes, ratio of currency notes to GDP, supply and disposal of soiled banknotes, printing cost for currency notes, size of the disposal of soiled banknotes & number of counterfeit (fake) notes detected by RBI and other bank in India over a period are covered in this paper.

This paper has used econometrics & statistical tools like mean, standard deviation, annual growth rate, correlation and regression for data interpretation. It is found that the total circulation of banknotes in India has increased over a period. The ratio of currency in circulation to GDP in India reached double digits in India. It is found that as supply of banknotes increases the disposal of bank notes also increases in India over a period. It is established that there is a positive correlation between growth in expenditure for printing of currency notes and total expenditure of RBI. The estimated regression line and equation explained that the printing cost for currency notes has positively effected the total expenditure incurred by RBI over a period. It is found that as the supply of currency notes increases the soiled and mutilated currency notes also increases in India. The number of counterfeit notes was also detected substantially over a period in India. Switching to a cashless economy is proposed as the optimal remedy to alleviate the challenges associated with the cash economy in India.

Keywords: *Cash, Cash Economy, Cashless Economy, Currency Notes, Counterfeit notes, Digital Payments, RBI.*

Introduction

From the annals of the past to the present day, a consensus remains elusive regarding the fundamental question of what constitutes money (Walters, 1973: 7). In the economic realm, the term 'money' extends beyond narrow definitions, adhering to the principle that money is characterized by its functions and actions (Hicks, 1967: 1). Conceptually, money can be delineated as any widely recognized commodity serving as a medium of exchange and a standard measure of value. Over time, a myriad of commodities has undertaken these pivotal roles, with the manifestations of money evolving from livestock to cards, and most recently, digital currency.

Following the collapse of the Western Roman Empire, coins, silver jewelry and hack silver (pieces of silver objects hacked into smaller units) remained the predominant forms of currency for centuries (Harper, Kyle, 2017). The inception of paper money can be traced back to China, where the practice of carrying folding money emerged during the Tang Dynasty (A.D. 618-907). Initially in the form of privately issued bills of credit or exchange notes, the Chinese utilized paper money for over 500 years before its adoption began in Europe during the 17th century (Lewis, Mark Edward, 2012). Despite taking another century or two for paper money to become widespread globally, China faced an advanced financial crisis during this period. The overproduction of paper notes led to a drastic devaluation, resulting in soaring inflation. Consequently, in 1455, China abandoned paper money altogether and refrained from reintroducing it for several hundred years.

In economics, cash is money in the physical form of currency, such as banknotes and coins. Businesses argue that refusing cash diminishes the risk of store robberies, eradicates the temptation for employees to engage in theft, saves time by eliminating the need for staff to commute to and from the bank, and even cuts costs by eliminating the necessity for cumbersome cash registers (Zagorsky, 2018). In the article 'Dirty Money,' Maron (2017) referred to a report in the Southern Medical Journal (2002), which revealed the presence of pathogens, including staphylococcus, on 94% of tested dollar bills. According to the findings, paper money might harbor more germs than a typical household toilet. Moreover, bills provided a favorable environment for unsavory microbes; while viruses and bacteria generally survive on surfaces for around 48 hours, paper money was reportedly capable of transporting a live flu virus for up to 17 days.

Cash plays a crucial role in overcoming transactional obstacles such as the absence of a double coincidence of wants, limited commitment, and asymmetric information, thereby enhancing overall welfare. However, in the New Keynesian synthesis (Woodford, 2003), a foundational framework for modern monetary policy, money is solely viewed as a unit of account. Within this cashless limit, the outcomes are contingent on the interest rate determined by monetary policy, rendering the specifics of changes in money supply essentially inconsequential. In this context, cash is perceived as a hindrance, imposing constraints on monetary policy by setting a lower limit on the nominal interest rate and facilitating illegal activities and tax evasion (Rogoff, 2016).

The study on the bacterial composition in banknotes (Heshikiet, Y & et. al., 2017) suggests that the circulation of cash provides a conducive environment for disease-causing bacteria. Embracing cashless payments mitigates several risks, including the threat of counterfeit money, internal theft of cash by employees, and incidents of burglary or robbery (Srinivasan S, 2017). The transition to a completely cashless system reduces the costs associated with physical security and the manual processing of cash (withdrawal, transportation, counting). It also diminishes the risk of businesses facing challenges in maintaining sufficient cash for transactions. Additionally, proponents argue that paper money contributes to corruption, terrorism, tax evasion, and illegal immigration. One notable societal benefit emphasized is

the difficulty of engaging in money laundering, tax evasion, illicit transactions, and funding illegal activities in a cashless society.

Now, we are living in a fully globalized and digitally advanced era where the manual exchange of goods and services is slowly being replaced by cashless transactions. Moreover, the cash economy poses many social evils in many developing countries including India. With this background, the present paper examined the burden of the cash economy in India. The challenges posed by the cash economy are scrutinized through the costs associated with printing currency notes, addressing the issues of soiled and mutilated currency, and tackling the problem of counterfeit (fake) currency notes within the Indian economic context (Sathyanarayana, 2021).

Literature Review

A substantial body of economic literature has contended that obstacles to the adoption of new technologies can be attributed to coordination failures (Rosenstein-Rodan, 1943; Carlton and Klammer, 1983). Coordination failures occur when decisions to adopt a new technology act as complements across users, meaning that the individual benefit of adoption for each user is positively influenced by the adoption of other users (Katz and Shapiro, 1985, 1986). In such scenarios, expectations of low adoption can become self-fulfilling. Although the theoretical understanding of coordination failures is well-established (Murphy et al., 1989; Matsuyama, 1995), empirical evidence directly highlighting their significance remains limited.

Chodorow-Reich & et al. (2020) conducted an analysis of a distinctive event in the realm of monetary economics—the 2016 Indian "demonetization." This policy swiftly rendered 86% of circulating cash as illegal tender, introducing new notes gradually over subsequent months due to printing press constraints. The immediate consequence was a significant decline in usable cash for transactions. The authors introduced a model of demonetization, positing that individuals hold cash to fulfill a cash-in-advance constraint and for the purpose of tax evasion..

Crouzet, N & et al. (2023) presented evidence highlighting the significance of coordination frictions in the adoption of technology, utilizing data from a major electronic wallet provider during the Indian Demonetization. Leveraging geographical differences in exposure to the Demonetization, the study demonstrated a persistent increase in wallet adoption in response to the substantial yet temporary contraction of cash. This aligns with the predictions of a technology adoption model incorporating complementarities. The paper introduced a dynamic model of technology adoption with complementarities, utilizing it to characterize key features of the response in the adoption of digital payments to a temporary shock affecting traditional payment methods. The authors further employed merchant-level data from India's leading fintech payment system, along with quasi-exogenous variations in exposure to the Demonetization, to empirically test the model's predictions.

Bjorkgren, D (2018) devised a method to estimate and simulate the adoption of a network good. Using transaction data spanning over 4.5 years from nearly the entire network of Rwandan mobile phone subscribers, the author estimated the demand for mobile phones by considering factors such as individuals' social networks, coverage, and prices. Additionally, the utility of adopting a phone was estimated based on its eventual usage, with subscriber calls revealing the value of communication with each contact.

Lotz, S. & F. Vasselín (2019) formulated a dual payment New Monetarist model, introducing the competition between electronic money (e-purse) and fiat money (cash). The two payment instruments

differ in terms of security, cost, and acceptability, leading to strategic complementarities that result in multiple monetary equilibria. The authors identified conditions under which e-money can coexist with or replace fiat money, shedding light on the factors contributing to the success or failure of e-purses in various countries. Furthermore, the study compared welfare outcomes when one currency or both circulate. It was established that when the risk of cash theft is endogenous, e-money cannot entirely replace cash. However, the adoption of e-money in parallel with fiat money can be facilitated by low inflation.

From the above literature reviews, it is found that there are only few studies focused on burden of the cash economy in India. But no studies systematically examined burden of the cash economy in India considering printing cost for currency notes, disposal of soiled & mutilated currency notes and size of the fake currencies in the economy. In this regard, this paper tries to fill these study gaps and make some policy suggestions at the end.

Methods

The present study primarily examined burden of the cash economy in India during 2008-2021. It is based on the RBI's data. This paper has used the statistical & econometrics tools like mean, standard deviation, annual growth rate formula, correlation and regression for data interpretation. Annual Growth Rate (AGR) formula has been used to calculate bank notes in circulation over a period by RBI. The formula of AGR as follows;

$$AGR = (P_1/P_0) / P_0 * 100;$$

Where P_1 is the Value of Present Year P_0 is the Value of Past Year

Karl Pearson's Coefficient of Correlation is used to find the degree of association between supply of banknotes and disposal of soiled banknotes over a period. It also used to find the correlation between total expenditure and printing cost for currency notes by RBI over a period.

Simple regression model has been used to calculate the cause and effects relationship and parentage influences of printing expenditure of currency notes (taken as Independent Variable) on total expenditure (taken as Dependent Variable) incurred by RBI during 2008-2021. The regression fitted trend line was also drawn along with the regression equation to calculate the cause and effects relationship between printing cost for currency notes and total expenditure by RBI. The estimated model as follows;

$Y = b_0 + b_1X + u$, this model specified as bellow;

Total Expenditure by RBI (TERBI) = $b_0 + b_1$ Expenditure for Printing of currency notes by RBI (EPCNRBI) + u

Results and Discussions

Money supply refers to the overall amount of money in circulation among the public at a specific moment. In India, measures of money supply are categorized into four groups: M1, M2, M3, and M4, alongside M0. M0, also known as Reserve Money, is denoted as high-powered money, monetary base, or base money. It encompasses currency in circulation, bankers' deposits with the RBI, and other deposits with the RBI.. The Reserve Bank has the sole authority to issue banknotes in India. The Reserve Bank, like other central banks the world over, changes the design of banknotes from time to time. The Reserve Bank has introduced banknotes in the Mahatma Gandhi Series since 1996 and has so far issued notes in the

denominations of Rs.5, Rs.10, Rs.20, Rs.50, Rs.100, Rs.500 and Rs.1000 in this series (RBI Annual Report, 2021).

Table 1
Bank notes in circulation (value in Crore at end of March)

Year	Value (Crore)	AGR (%)
2011	9358	---
2012	10528	12.50
2013	11648	10.64
2014	12829	10.14
2015	14289	11.38
2016	16415	14.88
2017	13102	-20.18
2018	18037	37.67
2019	21108	17.03
2020	24209	14.69
2021	28268	16.77

Source: RBI's Annual Reports

RBI has supreme authority to print and circulation of the currency notes in India. The value of the bank notes in circulation was 9358 crore in 2011 and it is increased to 28268 crore in 2021. It showed that there is a tremendous increase in the circulation of bank notes in Indian economy since 2011. The Annual Growth Rate (AGR) of bank notes in circulation in the year 2017 recorded negative growth (-20.18 %) but it has taken positive growth in the following year. The AGR of banknotes in circulation depicted that there are fluctuating trends over a period (Table 1).

The currency-GDP ratio, also known as the money supply or money stock to GDP ratio, is a measure that compares the total amount of money in circulation within a country to its Gross Domestic Product (GDP). This ratio provides insights into the relationship between the money supply and the overall economic output of a nation. Analyzing the currency-GDP ratio can offer information about the liquidity of an economy and the extent to which the money supply aligns with the production of goods and services. A higher ratio might suggest that there is a relatively larger amount of money circulating compared to the size of the economy, potentially leading to inflationary pressures. On the other hand, a lower ratio might indicate a situation where the money supply is insufficient to support economic transactions.

Table 2
Currency – GDP Ratio in Indian Economy (end March)

Year	Currency - GDP Ratio (%)
2011-12	12.12
2012-13	12
2013-14	11.6
2014-15	11.6
2015-16	12.1
2016-17	8.7
2017-18	10.7
2018-19	11.2

Source: RBI's Annual Reports

The Currency-to-GDP ratio was 11.2% in 2018-19, which was the highest in the last two years. The currency-to-GDP ratio was 8.7% and 10.70% in 2016-17 and 2017-18 respectively. The table s (2) showed fluctuations in the Currency-GDP Ratio over the specified years. There is variability in the percentage of currency in circulation relative to the Gross Domestic Product (GDP). The highest Currency-GDP Ratio was observed in the fiscal year 2011-12 at 12.12%. There is a significant drop in the Currency-GDP Ratio in the fiscal year 2016-17, reaching 8.7%. This could be indicative of various factors such as demonetization or shifts in monetary policy. The following fiscal year, 2017-18, saw an increase in the Currency-GDP Ratio to 10.7%, indicating a potential recovery or adjustment in the economy. In the subsequent years (2018-19), the Currency-GDP Ratio remained relatively stable, ranging between 11.2% and 11.6%.

The higher denomination notes encourage hoarding. In the process, India's currency-GDP ratio increased to 11.2 percent in 2018-19 from 10.7 percent a year ago with the expansion matched by liquidity injection through Liquidity Adjustment Facility (LAF) operations as well as outright open market purchases among the sources of reserve money and reflected in net domestic assets in the form of net RBI credit to the Government (table 2). Considering the presence of a huge informal sector in the Indian economy, a higher currency-to-GDP ratio suggests that economic transactions in the informal sector are picking up (Sathyanarayana, 2021).

Table 3
Supply and Disposal of Soiled Banknotes by RBI

Year	Supply (Million Pieces)	Disposal of Soiled Banknotes (Million Pieces)
2011-12	17584	13772
2012-13	19103	14130
2013-14	20918	14187
2014-15	23652	15137
2015-16	21195	16368
2016-17	29043	12503
2017-18	25003	27678
2018-19	29191	12393

Source: RBI's Annual Reports

The Reserve Bank's (India) currency management function is guided by the goal of ensuring adequate supply of clean banknotes of various denominations in the economy (RBI Annual Report 2018-19). The supply of banknotes increased from 17584 million pieces in 2011-12 to 29191 million pieces in 2018-19 which showed that there was a substantially increased supply of banknotes over a period. On the other hand, the disposal of soiled banknotes recorded steady growth during 2011-2019 (Table 3).

Table 4

Karl Pearson's Coefficient of Correlation between Supply and Disposal of Soiled Banknotes by RBI

Variables & Parameters	Descriptive Statistics (N = 8)	
	Mean	Std. Deviation
Disposal of Soiled Banknotes	23211.13	4326.649
Supply of Banknotes	15771	4983.167
Karl Pearson's Coefficient of Correlation (N=8)		
Supply and Disposal of Soiled banknotes & vice versa	0.972	
Sig (2-tailed)	0.015	

Sources: Authors' Calculation using Table 3

The relationship between supply and disposal of banknotes by RBI has been examined in table 4. Theoretically, it is proved that there is a positive relationship between growth in supply of banknotes and growth in disposal of banknotes in an economy. In this logic, the mean value of the supply of banknotes and disposal of soiled banknotes registered 23211 and 15771 million pieces respectively. It is established a high positive correlation (0.972) between growth in supply and disposal of banknotes and it is significant at 5 % (0.015). This indicated that as supply of banknotes increases disposal of banknotes also increases in India over a period and vice versa (table 3 & 4).

The Reserve Bank of India incurs expenditure in the course of performing its statutory functions by way of agency charges/commission, printing of notes, expenses on remittance of treasure besides staff related and other expenses (RBI Annual Report 2018-19). The total expenditure of the Reserve Bank increased from 82.18 billion in 2008-09 to 1298.01 billion in 2021-22. There was significantly increased expenditure by RBI over a period. One of the foremost economic burdens of the Reserve Bank of India (RBI) is the printing charge of the various denominations of currency notes in circulation (Sathyanarayana, 2021). This means that currency notes are circulating very significantly over a period in Indian Economy.

Table 5

Expenditure for Printing of Currency Notes & Total Expenditure by RBI (Rs. in Billion)

Year	Expenditure for Printing of Currency Notes by RBI (X)	Total Expenditure by RBI (Y)
2008-09	20.63	82.18
2009-10	27.54	84.03
2010-11	23.76	86.55
2011-12	27.04	101.37
2012-13	28.72	125.49

2013-14	32.14	119.34
2014-15	37.62	133.56
2015-16	34.21	149.9
2016-17	79.65	311.55
2017-18	49.12	282.77
2018-19	48.11	170.45
2019-20	43.78	925.4
2020-21	40.12	341.47
2021-22	49.85	1298.01
Total	542.29	4212.07
Mean	38.74	300.86
Std. Deviation	15.19	361.46
Correlation	0.41	

Source: RBI's Annual Reports

The expenditure incurred on printing of currency notes increased from 20.63 billion in 2008-09 to 49.85 billion in 2021-22. In the 2015-16 the expenditure incurred on printing of notes was very low (34.21 billion) mainly on account of decrease in the overall supply of bank notes, particularly of higher denomination notes and downward revision of rates by Bharatiya Reserve Bank Note Mudran Private Limited (BRBNMPL). However, the expenditure incurred in the printing of banknotes was 43.78 billion in 2019-20 it is substantially increased to 49.85 billion in 2021-22 due to the supply of new currency notes in circulation and the announcement of demonetization (Table 5). It makes sense that the Reserve Bank of India (RBI) would explore initiatives to move towards a cashless system, especially considering the increasing financial burden associated with the expenditure for printing currency notes.

The introduction of digital currencies and the promotion of cashless transactions can offer several benefits, both in terms of cost savings and the efficiency of the overall monetary system. Some potential advantages are cost reduction, efficiency and speed, transparency and accountability, financial inclusion, reduced counterfeiting and etc,. However, the transition to a cashless system also poses challenges, including issues related to cybersecurity, privacy, and ensuring that all segments of the population have access to and can use digital financial services.

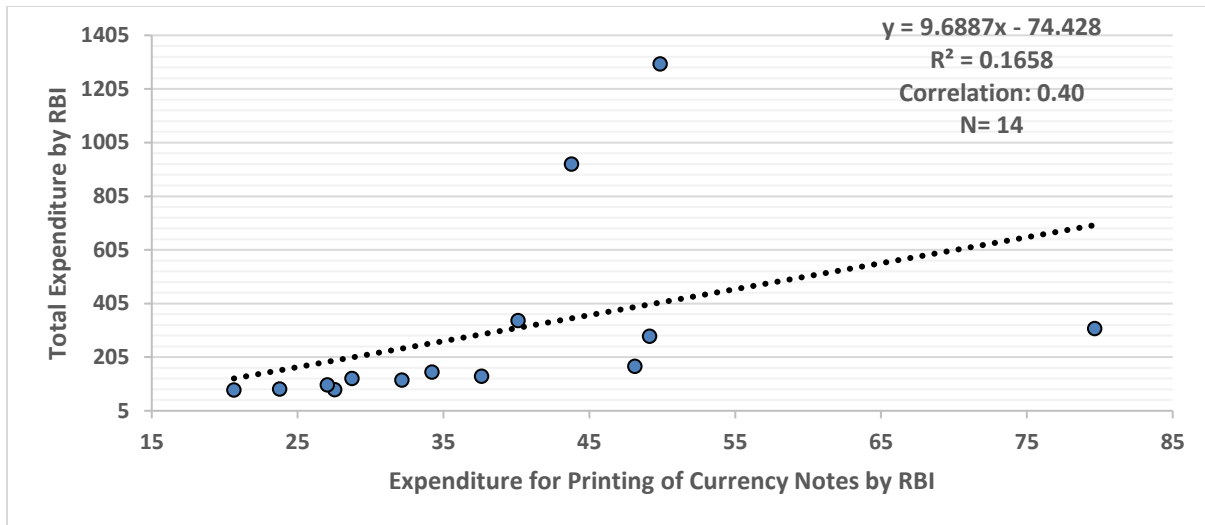


Figure 1:
Regression analysis between Expenditure for Printing of Currency Notes & Total Expenditure by RBI (Rs. in Billion)

Source: Authors' Calculation using Table 5

The relationship (both correlation & regression) between expenditure for printing of currency notes and total expenditure incurred by RBI has been examined in table 5, 6 and figure 1. Theoretically, it is proved that there is a positive correlation between growth in printing expenditure of currency notes and growth in total expenditure incurred by RBI. Hence, many of the studies have found that there is a cause and effect relationship between growth in expenditure for printing of currency notes and growth in total expenditure by RBI over a period. In this logic, the expenditure for printing currency notes and total expenditure of the RBI substantially increased from 20.63 & 82.18 billion (2008-09) to 49.85 & 1298.1 billion (2021-22) respectively. It is found that there is a positive correlation (0.41) between growth in printing cost of currency notes and total expenditure of RBI. This indicated that as expenditure for printing of currency notes increases total, the expenditure incurred by RBI also increases and vice versa (table 5,6 & figure 1).

Table 6

Estimated Regression Equation between Expenditure for Printing of Currency Notes & Total Expenditure by RBI (Rs. in Billion)

Coefficient/slope of X (b1)	9.6887
Intercept (b0)	-74.428
Number of Observation	14
Karl Pearson's Coefficient of Correlation	0.41
Regression Equation	$Y=9.688659x - 744.4281 + U$

Source: Authors' Calculation using Table 5

The cause and effect relationship (regression) between growth in expenditure for printing of currency notes and total expenditure of RBI has been examined using the single regression model (see figure 1 and table 6). It is found that printing cost for currency notes by RBI has influenced 16 % on total expenditure of RBI or in other words 16 % of changes in total expenditure are explained by the changes in the printing cost of currency notes. The most satisfying fact is that the sign of the coefficient (+) has followed the standard economic theory (expectation) that expenditure for printing of currency notes by RBI has a positive effect on total expenditure. The expected econometric equation is as follows.

$$Y = b_0 + b_1 X + u \text{ ----- (1)}$$

$$\text{Total Expenditure by RBI (TERBI)} = b_0 + b_1 \text{Expenditure for Printing of currency notes by RBI (EPCNRBI)} + u \text{ ----- (2)}$$

$$Y (\text{TERBI}) = -74.428 + 9.6887(\text{EPCNRBI}) + U \text{ ----- (3)}$$

The estimated regression line and equation (figure 1 and table 6) explained that if the expenditure for printing of currency notes by RBI goes up by 1 billion an average total expenditure would go up 9.6887 billion and printing cost for currency notes decreases by 1 crore an average total expenditure of RBI decreases by 9.6887 crore provided the other independent variable is constant. The estimated regression trend line takes positive increase and it also supported the existing theories (table 6).

Table 7
Disposal of Soiled Banknotes (in Million pieces)

Denomination (Rs.)	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
2000	0	0	0	0	0	0	0	1
1000	375	450	511	663	625	1514	6847	2
500	1994	2263	2405	2847	2800	3506	20024	15
200	0	0	0	0	0	0	0	0
100	5577	5627	4972	5173	5169	2586	105	3795
50	1578	1357	1398	1271	1349	778	83	835
20	562	609	725	801	849	546	114	1163
10	3584	3752	4128	4338	5530	3540	497	6524
Up to 5	101	72	48	44	46	34	8	59
Total	13772	14130	14187	15137	16368	12504	27678	12394

Source: RBI's Annual Reports.

The table 7 represents the number of soiled banknotes disposed of in millions for each denomination in the given years. It provides insight into the volume of currency in different denominations that was taken out of circulation due to wear and tear or other reasons. Some observations are;

Dominant Denominations: The 100 denomination has the highest count in most years, reflecting its common usage in everyday transactions. The 500 denomination also has a substantial count.

Introduction of 2000 Denomination: The 2000 denomination, introduced in 8th November 2016, shows a relatively low count until 2018-19. This could be due to the fact that the 2000 rupee note was introduced as a high-value note and may not be as commonly used in daily transactions.

Significant Increase in 1000 Denomination in 2016-17: The disposal count for 1000 denomination notes sees a significant increase in 2016-17, possibly due to demonetization efforts or other policy changes.

Trends in Other Denominations: The counts for denominations like 50, 20, and 10 vary across the years, reflecting the usage patterns and circulation of these notes.

Overall Trends: The total count of soiled banknotes shows fluctuations, with a notable increase in 2017-18, possibly influenced by various economic and policy factors. The data suggested an increasing trend in the disposal of soiled banknotes for some denominations over the years, particularly in the higher denominations.

The circulation of counterfeit notes poses a significant problem for economies and financial systems worldwide. The issue of counterfeit currency has indeed been a concern in India, and it has been cited as one of the motivations behind the demonetization move in 2016. The lack of a confirmed estimate of counterfeit currency in 2012, as admitted by the then Finance Minister, highlights the challenges associated with accurately assessing the extent of the problem. Demonetization, which involved the withdrawal of high-denomination currency notes (INR 500 and INR 1,000), was announced on November 8, 2016. The primary objectives stated by the government included curbing black money, corruption, counterfeit currency, and promoting a shift towards a more digital and transparent economy. The perception was that large denominations were being used for illegal activities, including the circulation of counterfeit currency. The move aimed to invalidate existing high-denomination notes, prompting individuals to deposit them in banks, where the authorities could scrutinize transactions for signs of illicit activities

Table 8
Number of Counterfeit Notes Detected (No. of pieces)

Year	Detection at Reserve Bank	Other Banks	Total
2011-12	37690 (7.2)	483465 (92.8)	521155 (100)
2012-13	29200 (5.9)	469052 (94.1)	498252 (100)
2013-14	19827 (4.1)	468446 (95.9)	488273 (100)
2014-15	26128 (4.4)	568318 (95.6)	594446 (100)
2015-16	31765 (5.0)	601161(95.0)	632926 (100)
2016-17	32432 (4.3)	729640 (95.7)	762072 (100)
2017-18	188693 (36.1)	334090 (63.9)	522783 (100)
2018-19	17781(5.6)	299603 (94.4)	317384 (100)
2019-20	13530 (4.6)	283165 (95.4)	296695(100)

Note: 1. Figures in parentheses represent the percentage share in total

2. Does not include counterfeit notes seized by the police and other enforcement agencies.

Source: RBI's Annual Report.

This table 8 provides information on the number of counterfeit notes detected in India over several years, categorized by detection at the Reserve Bank and other banks. The percentage breakdown provided insights into the distribution of counterfeit notes detection between the Reserve Bank and other banks. The total number of counterfeit notes detected increased from 2011-12 to 2017-18 and then decreased in subsequent years. The percentage of counterfeit notes detected at the Reserve Bank and other banks varies over the years. In 2017-18, there was a significant increase in the number of counterfeit notes detected, with a notable proportion being detected at the Reserve Bank. The percentage of detection at the Reserve Bank is particularly high in 2017-18, constituting 36.1% of the total. The substantial increase in 2017-18 may be a result of various factors, including improved detection capabilities or changes in counterfeiting patterns. The data suggested that there are variations in the prevalence of counterfeit notes from year to year (table 8).

Counterfeit currency is indeed viewed as a threat to the economic system. It can lead to economic losses, loss of public confidence in the currency, and potential disruptions to businesses and financial transactions. Governments and central banks worldwide take various measures, including the incorporation of advanced security features in currency notes, public awareness campaigns, and law enforcement efforts, to address the issue of counterfeit currency.

Conclusion & Policy Suggestions

The present paper has examined burden of the cash economy in India using RBI's data. the love for cash and the challenges it brings, right? It's a tricky situation—on one hand, cash is deeply ingrained in the Indian economy, and on the other, it poses significant logistical and financial challenges. The cost associated with printing currency, managing circulation, and tackling counterfeit issues is undoubtedly a burden. It's interesting how even the wear and tear of low-value notes contributes to the overall expense. The need for frequent replacement and upgrades to combat counterfeiting must be a never-ending cycle. Several countries, including India, have recognized the challenges associated with a high reliance on cash and have been actively working towards promoting digital payments and reducing the circulation of physical currency.

The present paper has applied statistical and econometrics tools to the data collected from various annual reports of RBI. It is found that the total circulation of bank notes in India has increased over a period. The ratio of the currency in circulation to GDP in India reached double digits in India. It is identified that as supply of banknotes increases, the disposal of bank notes also increased in India over a period. It is found that there is a positive correlation (0.41) between growth in expenditure for printing of currency notes and total expenditure of RBI. The estimated regression line and equation explained that the printing cost for currency notes has positively effected the total expenditure incurred by RBI over a period. It is noted that as the currency in circulation increases, the soiled and mutilated currency notes also increases in India. The number of counterfeit notes was also detected substantially over a period in India.

The shift towards non-cash transactions and settlements in everyday life gained momentum in the 1990s with the widespread adoption of electronic banking. By 2010, digital payment methods had become prevalent globally, featuring intermediaries like PayPal, digital wallets, and more. In the Indian context, this scenario envisions an economy where physical cash circulation is absent, and all transactions are seamlessly conducted through electronic and advanced payment channels. These encompass credit and debit cards, Immediate Payment Service (IMPS), National Electronic Funds Transfer (NEFT), Real-Time Gross Settlement (RTGS), Unified Payments Interface (UPI), and mobile-based apps, among others.

As digital payments are made, transactions are kept in records. With recorded financial transactions, the government can better track the movement of the money through financial records which enables them to track the black money and illegal transactions taking place in the country. Cashless payments facilitate the tracking of spending expenditure and record the movement of money. Having recorded transactions can help citizens to refine their budget more efficiently. This observation from the Worldpay Global Payments Report 2018 aligns with the broader trend of increasing digitalization of payments in many economies, including India. The dichotomy between cash dominating point-of-sale purchases and e-money (digital payments) dominating online transactions is common in several countries undergoing digital transformations.

References

- Azeez, N.P. Abdul, (2022). Does Demonetisation in India Achieve its Objectives?. *Economic and Regional Studies*, 15(3), 336-350.
- Björkegren, D. (2018). The Adoption of Network Goods: Evidence from the Spread of Mobile Phones in Rwanda. *The Review of Economic Studies*, 86 (3), 1033–1060.
- Business Line (2012, November 23, Updated 2018, March 12). RBI Plans to Gradually Replace Rs. 10 Bank Notes with Coins. *The Hindu, Business Line*.
<https://www.thehindubusinessline.com/money-and-banking/rbi-plans-to-gradually-replace-rs-10-bank-notes-with-coins/article23090155.ece#>
- Carlton, D. W. and J. M. Klammer (1983). The Need for Coordination Among Firms, With Special Reference To Network Industries. *The University of Chicago Law Review*, 50 (2), 446– 465.
- Chodorow-Reich, G., Gopinath, G., Mishra, P., & Narayanan, A. (2020). Cash and the Economy: Evidence from India's Demonetization. *The Quarterly Journal of Economics*, 135 (1); 57–103.
<https://doi.org/10.1093/qje/qjz027>
- Crouzet, N., Gupta, A., & Mezzanotti, F. (2023). Shocks and Technology Adoption: Evidence from Electronic Payment Systems. *Northwestern University Working Paper*.
https://www.kellogg.northwestern.edu/faculty/crouzet/html/papers/TechAdoption_latest.pdf
- Das, K., Mishra, B.S.P & Das, M (2020). *The Digitalization Conundrum in India: Context and Concerns*, *India Studies in Business and Economics*, in: Keshab Das & Bhabani Shankar Prasad Mishra & Madhabananda Das (ed.), *The Digitalization Conundrum in India*, 1-9, Springer.
- Harper, Kyle.(2017). *The fate of Rome. Climate, Disease, and the end of an Empire*. Princeton University Press 2017.
- Heshiki Y, Dissanayake T, Zheng T, Kang K, Yueqiong N, Xu Z, Sarkar C, Woo PCY, Chow BKC, Baker D, Yan A, Webster CJ, Panagiotou G., & Li J (2017). Toward a Metagenomic Understanding on the Bacterial Composition and Resistome in Hong Kong Banknotes. *Front. Microbiology*, 8 (632).
<https://doi.org/10.3389/fmicb.2017.00632>
- Hicks, J. R. (1967). *Critical Essays in Monetary Theory*. Oxford, Clarendon Press. Reviewed by Edward J. Kane, *The Canadian Journal of Economics*, 2 (1): 141–44.

- Katz, M. L. and C. Shapiro (1985). Network Externalities, Competition, and Compatibility. *American Economic Review*, 75 (3), 424–440.
- Katz, M. L. and C. Shapiro (1986). Technology Adoption in the Presence of Network Externalities. *Journal of Political Economy*, 94 (4), 822–841
- Lotz, S. and F. Vasselin (2019). A New Monetarist Model of Fiat and E-money. *Economic Inquiry*, 57 (1), 498–514
- Mani, S & Iyer, C. I. (2022). Diffusion of digital payments in India, 2011–2012 through 2020–2021: Role of its Sectoral System of Innovation, *Asian Journal of Technology Innovation*, DOI: 10.1080/19761597.2022.2125883
- Maron, D.F.(2017, January 3). Dirty Money - The Public Health Case for a Cashless Society. *Scientific American*. <https://www.scientificamerican.com/article/dirty-money/>
- Matsuyama, K. (1995). Complementarities and Cumulative Processes in Models of Monopolistic Competition. *Journal of Economic Literature*, 33 (2), 701–729.
- Murphy, K. M., A. Shleifer, and R. W. Vishny (1989). Industrialization and the Big Push. *Journal of Political Economy*, 97 (5), 1003–1026.
- Reserve Bank of India (2020). Assessment of the Progress of Digitisation from Cash to Electronic. <https://m.rbi.org.in/Scripts/OccasionalPublications.aspx?head=progress%20of%20digitisation%20from%20cash%20to%20electronic>
- RBI (2019, September 15). Handbook of Statistics on The Indian Economy – 2018-19. <https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/OHB201819A91A298806164470A2BCEF300A4FE334.PDF>
- RBI (2008-2021). Reserve Bank of India Annual Reports from 2008-2021.
- RBI (2019, December 24). Report on Trend and Progress of Banking in India 2018-19. <https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/ORTP241219FL760D9F69321B47988DE44D68D9217A7E.PDF>
- RBI (2020, February). Reserve Bank of India Bulletin 74 (2). <https://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/OBUL11022020FL847E8EFB34744BAEBB2E45E91759ACCD.PDF>
- RBI (2020, March) Reserve Bank of India Bulletin 74 (3). <https://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/OBUL11032020FL5C1B8A7B6ED44EB1A17CF47EA1D052A7.PDF>
- Rogoff, K. S. (2016). *The Curse of Cash: How Large-Denomination Bills Aid Crime and Tax Evasion and Constrain Monetary Policy*. Princeton University Press
- Rosenstein-Rodan, P. N. (1943). Problems of Industrialisation of Eastern and South-Eastern Europe. *The Economic Journal*, 53 (210/211), 202–211.

Sathyanarayana (2021). Cash Economy in India: An Economic Analysis. *SAARJ Journal on Banking & Insurance Research (SJBIR)*, 10 (4), 28-34.

Shekhawat, A, S. (2016, Sep. 23). Burden of Cash on Indian Economy. <http://www.cdfi.in/blogs/burden-of-cash-on-indian-economy>

Singhraul, B P & Garwal, Y, S (2018). Cashless Economy - Challenges and Opportunities in India. *Pacific Business Review International*, 10 (9): 54-62.

http://www.pbr.co.in/2018/2018_month/March/6.pdf

Srinivasan, S (2017, July 17). Going Cashless? Bad for Tax Cheats, Privacy, Poor. *Bloomberg Businessweek*. <https://www.bloomberg.com/news/articles/2017-07-17/going-cashless-bad-for-tax-cheats-privacy-poor-quicktake-q-a>

Walters, A.A. (Ed) (1973). *Money and Banking: Selected Education*. Penguin.

Woodford, M. (2003). *Interest and Prices: Foundations of a Theory of Monetary Policy*.

Princeton University Press.

Worldpay (2018, November). Global Payments Report – 2018, The Art and Science of Global Payments a Definitive Report, *Worldpay*.

http://offers.worldpayglobal.com/rs/850-JOA-856/images/Global%20Payments%20Report_Digital%202018.pdf

Zagorsky, J L . (2018, August 2016). If Cash Is King, How Can Stores Refuse To Take Your Dollars?. *The Conversation*. <https://theconversation.com/if-cash-is-king-how-can-stores-refuse-to-take-your-dollars-63516>