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RESEARCH PAPER

Linkage between Tax Burden and Demand for Currency in Pakistan

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ABSTRACT

The purpose of this study is to examine the effect of tax burden on the demand for currency in Pakistan and the examination is delimited to total tax revenue only. High formal tax burdens drive individuals toward cash transactions to evade documentation. The study follows quantitative methodology and uses ARDL approach on time series data from 1979-2023. Variables used are currency ratio, tax-to-GDP ratio, interest rates, domestic credit to private sector, inflation and a dummy variable to capture structural shocks from Covid 19. The resulting model is tested with diagnostic tests to confirm its stability and robustness. The study reveals a highly significant and positive relationship of tax burden with the currency demand; and a negative and significant relationship between interest rate and currency in short and long run. Private sector growth and inflation both have significant and negative impact on demand for currency in the short run but not in the long run. Authorities should expand the tax base, reduce tax rates, and encourage digital payments to control high cash transaction.

Keywords: Tax burden, Currency demand, ARDL (bounds testing)

Introduction

The world today is being shaped by an era of high digitalization and electronic currency. The speed at which technology is progressing, it will not be long before the world will see a completely cashless society. The idea of becoming cashless has intrigued many researchers throughout the world. Highly developed countries are on the verge of achieving this feat, because of their strong banking channels and stable tax regimes. However, developing economies, like Pakistan are still lagging far behind. Reason for such backwardness lies in political instability, corrupt regimes and distorted tax policies. Pakistan has one of the lowest taxes to GDP ratio compared to its counterparts. The reason lies in its narrow tax base and high tax burden. At the same time, the country has witnessed a persistent increase in the ratio of currency in circulation to bank deposits and to GDP. The surge has occurred especially during episodes of intensified documentation drives and the imposition of new transaction-based levies on banking activity. This co-movement between a rising effective tax burden on formal, traceable transactions and a rising preference for cash suggests that tax policy may be an important determinant of currency demand. Not only does it affect the shadow economy but also impacts more direct portfolio and precautionary channels.

To understand the link between tax burden and demand for currency, we can look at it through a standard money demand framework, adding in tax factors(Al-Tarazi, 2021). In basic models of money demand, people decide how much of their wealth to keep in cash. This decision is based on things like transaction needs, the cost of holding cash(Cagan, 1958) versus earning interest on deposits, and their expectations around inflation and income.

When taxes are applied unevenly across different financial instruments and types of transactions, the after-tax returns in the official financial system decrease. This situation can lead people to shift away from documented transactions. Higher taxes, more widespread withholding taxes, and stricter enforcement can drive individuals and businesses to use cash more often to avoid taxes. The "currency demand approach" ties tax burdens directly to this behavior, suggesting that higher taxes encourage more tax evasion, which results in a greater demand for cash (Cagan, 1958).

In Pakistan, for instance, a higher tax burden increases the demand for currency. People tend to move toward cash transactions as a way to evade or avoid taxes, leading to a higher currency-to-deposit ratio in monetary statistics. As tax rates and burdens rise, both businesses and individuals are more likely to shift part of their activities to the informal sector. In these informal transactions, cash is preferred because it leaves no paper trail and it is harder for tax authorities to trace compared to bank transfers or documented payments.

Studies on Pakistan's currency demand (Aslam, 1998; Kemal, 2007; Yasmin & Rauf, 2004) have used the currency demand approach and found that when domestic tax revenues or tax rates increase, there is a statistically significant rise in the currency-to-money ratio (CC/M2). This confirms that higher taxes push more transactions into cash, increasing the demand for currency rather than deposits. This relationship becomes even stronger during periods of heavy tax enforcement or documentation drives.

In 2015 to boost tax base the Pakistani government introduced higher rates of withholding taxes on bank transactions and preferential tax treatment for filers and non-filers. Instead of broadening the tax base these measures had an unintended impact on increasing the gains of conducting transactions in cash and led to a substantial rise in currency in circulation. The report on the impact of the State Bank reveals that withholding holding taxes made only a small contribution to tax revenue. In terms of percentage contribution it was 0.9 percent (cash withdrawals) and 0.6 percent (non-cash transactions) of the FBR tax receipts per year since 2015 respectively. However, these small percentages had a large impact on currency in circulation. The annual growth in currency in circulation spiked to around 21.5 percent (average) from 2015 to 2017 compared with about 14 percent average growth in the previous eleven years. Econometric analysis ascribes this increase to a large extent to the introduction of the WHT on bank transactions (SBP, 2017). Therefore, in attempting to increase tax collections through a transaction-based withholding tax, a de facto tax on formal bank deposit transactions was imposed. This in turn induced firms and individuals (especially non-filers) to avoid the tax by withdrawing and using cash, thereby increasing currency in circulation while bank deposits and deposit ratio fell. In short, a little bit of additional revenue was accompanied by a lot of behavior changes: more withdrawals from banks, more cash for payment to avoid WHT, more splitting transactions to stay out of the formal sector, thereby tying up revenue-raising via WHT and the growth in currency in circulation (SBP, 2016).

The empirical evidence from Pakistan-specific applications of Cagan's approach on currency demand includes tax variables (often local tax revenue to GDP) and shows a positive effect of tax variables on real currency demand, in line with the hypothesis that increased effective tax rates promote more currency use for tax evasion purposes and increase inelasticity of the formal tax base. In Pakistan, the manner in which the government raises revenue affects the amount of money that people would like to hold in cash as opposed to bank deposits. If revenue is raised primarily by increasing rates and transaction-based (withholding) taxes that are collected through banks, taxpayers tend to increase their cash holdings, which raises the level of currency in circulation and the currency-to-deposit ratio.

Pakistan has a large cash-intensive informality. Various estimates put its share from one-fifth to over half of official GDP, at different times and with different approaches.

Common activities are informal retail and wholesale trade, unregistered workshops and services, cash-only deals in real-estate and wholesale goods, under-invoicing and other informal transactions. When the government attempts to increase tax returns primarily by increasing tax rates and adopting WHT, without major changes in quality of enforcement and simplification of tax administration, some of the formal economy moves into or expands activities in this cash-oriented informal economy (Arby, Malik, & Hanif, 2010). With more transactions going off the books and being paid in cash, the demand for cash grows. Thus currency in circulation becomes a proxy for informal activity and the tax-driven evasion pressure.

The tax cash link is backed up by other fiscal and macro factors. Large fiscal deficits funded by the banking system increase liquidity. This, together with low confidence and inflation expectations, can lead to higher currency shares. Inflation and depreciation increase nominal transaction and precautionary balances, especially in a cash-based retail and services sector. Remittance-driven and consumption-driven growth, in a setting where digital and card payments are under-developed, often translate into more cash spending instead of higher bank-based transactions. If tax revenue is increasingly extracted via indirect taxes and WHT on this narrow-documented segment, the rest of the economy has yet another reason to stay cash-heavy, further swelling currency in circulation (Manzoor, Javed, Ahmed, & Rauf, 2021).

At the core there is a trust and governance problem. Studies on Pakistan highlight complex tax laws, frequent changes and amnesties, high compliance costs, and perceptions of corruption and poor value for money in public spending, all of which depress tax morale (Batool, Hasan, & Kousar, 2022). Multilateral assessments note that despite various measures, Pakistan's tax-to-GDP ratio has remained low (around 10–11 percent) because the tax base is narrow and informality is persistent (Manzoor et al., 2021). In such an environment, every new revenue measure that targets the easy nodes of the system, i.e. banks, documented firms, visible salaried classes reinforce the belief that using the formal financial system is risky from a tax perspective. Many will rationally choose to:

- Keep more cash as working capital and savings
- Not register businesses, use POS or issue receipts
- Divide activities into several small and low-profile firms.

This can lead to periods in Pakistan where tax revenue (particularly WHT, withholding tax, and indirect taxes) increases. But at the same time currency in circulation and the C/D ratio also increase, while bank intermediation is weak. This demonstrates the connection between tax revenue and currency in circulation to be structural. If revenue is raised in ways that penalize formality and bank use, it will almost automatically push people toward holding more cash. Pakistan has seen a simultaneous surge in currency demand and only modest gains in tax collection over the last decade, with recent years marked by exceptionally high cash usage and a low tax to GDP ratio. Recent SBP data shows currency in circulation is growing faster than overall economic activity, while the formal tax take remains stuck in single digits of GDP. Although there has been some improvement in the most recent years (Munir & Riaz, 2020).

State Bank data reported cash in circulation (currency in circulation) at about Rs 9.2 trillion, equal to roughly 30% of broad money (M2) in 2023 and around 11% of GDP, compared to about 5% of GDP on average in comparable emerging economies. The World Bank reported that in 2023 reserve money and currency in circulation grew by about 23% and 21% respectively, exceeding monetary base growth during the COVID-19 period despite weak real activity. Highlights from the Pakistan Economic Survey 2024-25 indicate that currency in circulation increased by Rs 1,108 billion in June 2025, compared with a

contraction of Rs 498 billion in the same period a year earlier. This indicates persistent and recently accelerating cash demand (SBP, 2024).

According to SBP staff work on "The Conundrum of Rising Demand for Currency in Pakistan" the share of currency in M2 rose from about 23% to above 28% between the late 2000s and the late 2010s, with a structural break around 2015 when currency deposit ratios began rising more sharply. This period coincides with intensified documentation and withholding-tax measures on formal financial transactions, as well as higher inflation and exchange-rate depreciation, all of which the SBP links to growing preferences for cash holders (SBP 2017). Recent commentary emphasizes that, unlike many countries moving toward digital payments, Pakistan "is moving in the opposite direction". Rising cash use and a growing informal/shadow economy footprint if highly reflecting in high currency in circulation to GDP ratios.

The Pakistan Economic Survey 2023-24 shows that the tax to GDP ratio dropped to 8.5% in 2023 and has hovered around 8.4% to 9.8% for the past six years, highlighting the persistently low tax effort to GDP ratio. Despite poor performance on macroeconomic indicators, FBR's gross collection has grown by about 16.5% in 2023 to Rs 7,163.8 billion (from Rs 6,148.5 billion in 2022) with the contribution of direct tax to total FBR revenue increasing from 37.2% to 46%, suggesting a slow but steady increase in the direct tax burden. The latest FBR briefings put the tax-to-GDP ratio at 10.2-10.3% in FY2024-25 (up from 8.8-8.83% in FY2023-24) following an enforcement-focused reform program, which means some relief for the compliant taxpayer as the base expands (Hassan, 2024).

Pakistan's fiscal deficit in FY23 was still high at 7.8% of GDP with increasing interest payments, so the tax system is still a web of indirect and withholding taxes. This results in a higher burden felt by the official sector and taxpayers. Repeated reliance on withholding at source, differential rates for filers vs non-filers, and transaction specific levies on bank usage encourages a shift to cash. This links rising perceived tax burden on formal channels to greater currency demand.

Literature Review

For years, Pakistan has been underperformed in the areas of low tax to GDP ratio, greater cash economy and skewed tax regimes. The relationship between tax burden and higher cash dealings has promoted unofficial channels of economic activity. This has created a hazard for the officials to actually formulate effective policies as most of the macroeconomic figures are misleading. Hence there is a dire need to explore the relationship tax burden with the demand for currency in Pakistan. The literature review is organized thematically rather than chronologically. Conceptual foundations, Pakistan's fiscal and monetary setting, cross country evidence, Pakistan focused studies and methodological challenges are dealt separately.

Modern analyses of currency demand are rooted in broader theories of money demand. In the Keynesian framework, economic agents hold money for transactions, precautionary, and speculative purposes. This desire to hold money responds to income, interest rates, and uncertainty (Keynes, 2018). Tobin's treatment of liquidity preference as behavior under risk, reinterprets money as one asset within a broader wealth portfolio, whose relative share depends on the tradeoff between risk and return (Tobin, 1956).

The empirical apparatus was provided through early (Cagan, 1958) work on demand of currency at high inflation. The research associated the presence of currency with macroeconomic and institutional factors. It is the same methodology that (Tanzi, 1983) and (Arby et al., 2010) used to measure the underground economic activity. Tanzi (1983) directly related this device to tax policy, by proposing that an increase in (or more distortionary) tax rate would increase incentives to evade, increase unreported

transactions, and hence increase the currency-quantity demanded compared to other elements of the money stock. In Tanzi (1983), tax variables (i.e. average or marginal effective tax rates) are added in the currency demand equation together with conventional determinants like income, interest rates and inflation. Thus spreading such increased tax burden results in increased cash transactions. The increased tax rates increase the individual gain of non-reporting his or her actual income. extend the individual gain of withholding reported income. This brings about tax evasion. Since cash transactions are more effective in hiding such behavior, people and companies react to this by depending on more cash, and cash demand rises (Feige, 1996; Schneider & Enste, 2000).

One of the critical aspects in the literature is that tax burden is not all the factors that determine currency demand. Financial inclusion, urbanization, innovation in payments, agriculture and cultural orientations towards cash are also important factors (Humphrey, Pulley, & Vesala, 1996). In third world countries such as Pakistan, there are also high demand levels due to low bank account penetration, low access to digital payments, and high costs of banking transactions, without their tax implications (Demirguc-Kunt, Klapper, Singer, Ansar, & Hess, 2018). Thus, empirical studies must be rigorous and manage these factors and not explain all extra cash use by tax pressure. It is a repeated motif in more recent work in the currency demand literature which explicitly condemns too mechanical interpretations of the Tanzi-type models (Schneider & Buehn, 2018).

The connection between tax burden and currency demand is of interest to policy makers since they determine the trade-off between raising more revenues and maintaining a strong, well documented tax base. When raising taxes substantially augers up cash reserves and widens the shadow economy, then an effort to raise revenue mainly by raising rates can prove to be counterproductive. With the growing number of transactions being underground, increasing compliance costs, and reduced trust in the fiscal system, the tax base is to be eroded. Conversely, the empirical apparatus was furnished by a tax and financial-sector strategy which Early work of Cagan (1958) on currency demand under high inflation had produced. The authors associated currency holdings with institutional and macroeconomic variables. The same methodology was altered to measure the underground economic activity by Tanzi (1983) and Arby et al. (2010). Tanzi (1983) directly linked this device to tax policy by implying that an increase in (or more distortionary) tax rates increases incentives to avoid, increase unrecorded transactions, and thus raise the currency demand in comparison with other elements of the money stock. In Tanzi (1983) the tax variables (average or marginal effective tax rate) are introduced on the same level as such standard determinants as income, interest rates and inflation in currency demand equation. Thus spreading up that increased levy results in increasing the amount of cash transactions. An increase in tax rates increases the individual benefit of not reporting his or her actual income. increases the private benefit of the suppression of reported income. This brings about tax evasion. Since cash transactions are more convenient at hiding such an activity, people and corporations react to this by becoming more dependent on the use of currency, which results in a rise in the demand to hold cash (Feige, 1996; Schneider & Enste, 2000).

The empirical model typically gives the logarithm of the ratio of currency in circulation to some larger monetary aggregate (e.g. M2 minus currency) or to income as the dependent variable, and Tax burden variables and controls as the independent variable. The positive coefficient on the tax burden variable which is statistically significant in the case that other factors are held constant is construed as an indication that higher taxes enhance the demand of currency. Such a relationship was observed in many early studies, especially in OECD countries and in some emerging economies though estimates were highly varied, depending on the specification and identification assumptions (Schneider & Enste, 2000). Critics, however, pointed out that parameter estimates are susceptible to model specification, and data quality (Breusch, 2005; Dell'Anno & Schneider, 2009).

More current research has attempted to narrow down the relationship between tax burden and currency demand by:

- The difference between various forms of taxes (e.g. labor vs consumption vs capital taxes).
- Exploiting cross-country and long-run variation by the use of panel data methods.
- Inclusion of institutional variables like governance rule of law and corruption indices.
- Considering technological change in payments (card use and digital payments) (Jobst & Stix, 2017).

As has been established by Schneider and Buehn, Dell'Anno, and Schneider (2018), high labor tax, and social security contributions are linked with increased currency demand, particularly with weak enforcement and high rates of self-employment in Europe. The effect of VAT rates and enforcement campaigns on cash demand has also been investigated in other studies in Europe. Their results revealed that in weakly complying countries, VAT rate increases can cause currency demand to increase in the short term, but with stronger enforcement and digitalization can counterbalance this increase in the long term (Atanasijević, Danon, Lužanin, & Kovačević, 2022). Post-global financial crisis literature and the emergence of digital payments has indicated a paradoxical dual nature of the reduction of small denomination cash usage and increase in large denomination note usage, which is likely to be a store of value and facilitating tax evasion and other illegal activities (Rogoff, 2017). This has entrusted the comparison that the currency demand and tax burden are strongly interconnected.

Similar trends are followed in the studies of transition economies in Eastern Europe and the Balkans, where both the incentives to use cash and to report income have been noted to be transformed due to overhaul of the taxation policy and capacity to enforce (Schneider & Buehn, 2018). On the whole, this foreign literature concurs with the notion that increased tax burden tends to be associated with increased currency demand. However, it consistently stresses that this relationship is not uniform: it depends heavily on institutional quality, the level of financial development, and whether revenue is raised more through direct or indirect taxes. The same body of work also highlights the empirical difficulty of cleanly identifying the effect of taxes on cash demand, given the many overlapping factors that influence the use of currency.

In line with the standardized theory of money demand, the negative relationship between interest rate and currency demand is reflective of high opportunity of holding non-interest-bearing cash when there is a rise in the policy rates. Empirical work associated with money demand opine in favor of the notion that an increase in interest rates results in reduction in the desire to hold non-interest-bearing cash in Palestine (Awad & Alazzeh, 2020). The negative linkage between the domestic credit provided by the private sector and money demand is deeply rooted in the analogy that as private sector witnesses' growth, more transactions occur through banking channels rather than cash (Szpunar, 2020). Furthermore, inflation has a negative linkage with the demand for currency as it causes an erosion of real value of money balances. This causes individuals to reduce their desire to hold more cash (Tobin, 1956). In such cases the increase in inflation acts as an implicit tax on cash holdings and encourages investment other than money i.e. in real assets or foreign currency (Marthinsen & Gordon, 2022b).

Pakistan is widely characterized as a low-tax country with a narrow base and high reliance on distortionary and regressive taxes. The tax to GDP ratio has historically hovered in the range of roughly 9 to13 percent, below many peer countries which is quite below the level required for sustainable development financing Salman and Ali (2022). The tax system at federal level is administered by Federal Board of Revenue (FBR), which administers direct taxes (income and corporate taxes) and indirect taxes (mainly sales tax and customs duties). Provincial governments levy agricultural income tax, property-related levies, and

certain service taxes, but revenue mobilization at the subnational level remains limited (Ahmed, 2019).

There is skewness of tax revenue bent heavily towards the indirect taxes. On the other hand, the government faced difficulty in increasing the direct taxes because of political friction and tax evasion (Salman & Ali, 2022). Furthermore, the government extensively employes presumptive taxes. These presumptive and withholding taxes act like indirect taxes rather than genuine taxation on income (Ahmed, 2019). There are many implications linked with such tax structure when it comes to the relationship between tax burden and demand for currency. First, the deduction of withholding tax at source results in people finding informal channels of transactions. This often results in more cash usage. Second, a narrow base when it comes to indirect tax means that's the actual tax burden is pulled by firms working in a relatively small official sector and salaried individuals. This encourages tax evasion, increases the perception of unfair governance and weakens tax morale. Third, frequent tax amnesty schemes and weak enforcement may reduce the perceived cost of evasion, while rising statutory rates and broadened withholding may raise the perceived benefit of shifting to cash (Awasthi & Engelschalk, 2018).

Historically, Pakistan has been a cash-based economy with the money circulating in the economy making a comparatively large portion of broad money. Even though exact ratios differ over time, various reports by different studies and the central bank reveal that currency to deposit ratio in Pakistan has tended to be higher than in most emerging markets and has sometimes increased due to change in tax policies that influence banking transactions (Arby et al., 2010).

The Pakistan financial environment is characterized by a number of aspects that explain the continued currency demand. The 2010s and early 2020s have seen an improvement of bank account penetration, although it remains modest, particularly among women and rural residents, compared to international standards (Demirguc-Kunt et al., 2018). The banking service price and the distance to bank branches and ATM is still a major deterrent. Despite a significant growth in the digital and electronic currency transactions, the cash transactions remain predominant (I. Khan & Jaffar, 2021). The shadow economy of Pakistan is very big (around 30 to 30 percent of GDP). This huge shadow economy is another contributing factor to increase in frequency of cash usage (Arby et al., 2010). In this environment, tax policy actions that directly focus on banking transactions, like withholding taxes on cash withdrawals and non-filer bank accounts are of particular significance to the tax burden currency demand nexus. They can unwillingly introduce a tax wedge between cash and formal financial instruments that will promote both inferior banking transactions and increased demand of the physical money.

In comparison with certain other nations, there are relatively few studies, which directly and systematically examine the impact of tax burden on currency demand in Pakistan. However, there is a variety of scholarly and policy input that is informative, which can be broadly divided into three sets of research: work on general money demand and the currency-deposit ratio, work that extrapolates the size of the shadow economy based on currency demand models, and evaluations of particular tax policies that alter banking behaviour and cash use.

Many Pakistani studies estimate money demand mostly in order to determine the stability of money demand to design monetary policy but not to analyze the issue of taxes explicitly (Kemal, 2007). These analyses however continue to illuminate how currency and deposits are held in the economy.

Indeed, Qayyum, Khan, Khawaja, and Khalid (2005)among others, estimate money demand functions through ARDL and cointegration methods and inform that income, interest rate, and inflation are core factors that drive broad money demand in Pakistan.

Based on this, later studies consider the currency deposit ratio as the variable of interest and examine its determinants. More recent analyses, such as central bank and think-tank analyses have probed bursts in the currency deposit ratio after certain policy changes, such as tax measures. As an example, a rise in withholding tax rates on cash withdrawals and other banking operations during the mid-2010s was preceded by a significant rise in the ratio of currency deposits and the utilization of non-bank channels by many observers as an indicator that withdrawals tax was discouraging the use of formal banking (Nasir, Ahmed, Ayyoub, & Tahir, 2024). While these assessments are often descriptive, they align with the theoretical expectation that taxes on banking transactions raise the demand for physical currency.

Furthermore, holding on to non-interest-bearing cash with the country is subject to high policy rates and has a very high opportunity cost in the country. This is supported by the study conducted by Munir and Riaz (2020), suggesting that an increase in the policy rates results in reduced demand for currency. This causes a reallocation of funds towards formal banking channels. This reaffirms the notion that an increase in the interest rate results in a reduced demand for the currency. Moreover, the growth in the private sector causes a high use of banking channels rather than cash. This reduces the demand for cash in the economy. According to Munir and Riaz (2020), higher ratios associated with private sector credits result in higher use of electronic payments. This results in lower currency to broad money ratio. This study is in line with Arby et al. (2010). The study propagated that greater domestic credit to the private sector negatively affects the demand for cash in the short run, thereby indicating that financial development causes a reduction in reliance on cash transactions. Internationally supportive evidence that inflation causes a reduction in the value of real money balances thereby reducing the desire for holding cash, holds true for Pakistan as well (Kemal, 2007). Inflation enters the money demand equation with a negative sign and is often statistically significant. This not only reflects the eroding nature of purchasing power in Pakistan due inflation but also a reallocation of portfolio from cash to real assets (M. A. Khan, Qayyum, Sheikh, & Siddique, 2005).

A second, more directly relevant strand of work applies the currency demand approach to estimate the size of Pakistan's shadow economy. In the presence of limited third-party reporting and weak audit probabilities, holding and using more cash becomes a rational response to greater expected tax pressure. This mechanism has been empirically incorporated in equations of currency-demand with tax variables (tax-to-GDP ratio, average effective tax rates, or an indicator of indirect tax burden) as independent variables and real currency holdings or currency in circulation as a value relative to a larger monetary aggregate. A positive and statistically significant coefficient on tax variables is generally viewed as a demonstration that higher taxation is an incentive to more demand on cash which is in line with the growth of the shadow economy (Tanzi, 1983). In Pakistan, numerous studies with versions of this methodology have generally concluded that increase in taxes is correlated with increase in currency demand, but the size of the effect and the estimated size of the underground economy depends on the model specification, data coverage and identification assumptions (Yasmin & Rauf, 2004).

Pakistan is an exceptionally relevant example of analyzing the connection between tax burden and currency demand since it has a low total tax rate but the perception of heavy and unfair taxation of the formal sector (Kemal, 2003). Previous literature using monetary methodologies has discovered that the size of the underground economy can be as large as a half of the reported GDP at certain times with tax avoidance being a significant part of the difference between potential and actual revenue. More recent works, which adopt MIMIC modelling, affirm that tax burden, business regulation, unemployment, and governance indicators continue to be a significant cause of the shadow economy in Pakistan in the 2010s and early 2020s (Jabbar & Iqbal, 2021). The results support the perception that

informalization brought about by taxation is not an isolated historical event but an ongoing limitation on fiscal capacity and legitimacy of the state.

The empirical literature on Pakistan has applied currency-demand approach in various forms and they differ in their definition of tax burden, monetary aggregates and control variables but they all have the overlaying assumption that increase in taxes should produce an increase in currency demand in case they lead to evasion (Arby et al., 2010; Kemal, 2003). Moreover, the prior literature is earlier than the major changes to financial transactions including the accelerating growth of mobile and internet banking, the emergence of withholding and advance tax regimes, and the fiscal tightening events of 2018/19, which probably shifted the nexus of the tax burden, formal financial intermediation, and the use of cash (Manzoor et al., 2021).

This changing literature presents a number of research gaps to Pakistan. To begin with, much of the available estimates of the underground economy and the determinants of taxation are based on data that is up to date at the beginning of the 2000s (at best, the beginning of the 2010s) and therefore do not reflect recent tax reforms, digitalization initiatives, or the macroeconomic shocks of the past decade (Yasmin & Rauf, 2004). Second, such studies generally consider the tax burden in a single aggregate form that frequently sums up tax to GDP ratio without differentiating various types of taxes (including income tax, sales tax, withholding taxes, and excise duties) that could have different impacts on currency demand and informality (S. Khan, Khan, & Padda, 2025). Third, empirical studies that explicitly model the joint dynamics between currency demand and tax burden and recorded measures of enforcement and financial development, including POS integration and e-invoicing or mobile banking penetration, are limited (Younus, Nurmandi, Suardi, & Gul, 2023). To eliminate these gaps, it is necessary to have updated econometric analyses that capitalize on recent data and more detailed forms of both monetary and fiscal variables of currency demand (Ali & Audi, 2018).

Arby et al. (2010) hypothesized to examine the relationship between currency demand and tax burden in Pakistan through a modern time-series model, say autoregressive distributed lag (ARDL) bounds-testing model, on data that capture recent years of aggressive tax reform, and financial innovation. The main hypothesis of the research was that an increase in effective tax rates, especially when focused on a small formal base, would boost the relative desirability of cash transactions, and would therefore boost the demand of currency beyond amounts suggested by traditional money-demand variables. Another contribution of the study is that the implied size of the tax-related shadow economy and the revenue losses were quantified, thus informing the discussion of the tax gap in Pakistan and documentation policy design.

The underground economy and tax evasion in Pakistan have been the focus of a number of studies that are based on either currency-demand method explicitly or implicitly (Kemal, 2007; Yasmin & Rauf, 2004). Yasmin and Rauf (2004) also note a significant early contribution of estimating the size of the underground economy in Pakistan in 1974-2002 based on a currency-demand model that includes lagged tax-to-GDP ratio as a major explanatory variable. Their findings indicate that the coefficient of the lagged total taxes is positive and significant and this supports the hypothesis that an increase in the tax load will encourage agents to incur more cash-based and tax-evading activities (Yasmin & Rauf, 2004). Such a view supports the usefulness of currency-demand models in understanding the overall impact of these micro-level actions (Schneider & Buehn, 2018; Yasmin & Rauf, 2004).

The research on currency demand and the underground economy in Pakistan has been mainly conducted in two methodological approaches (Kemal, 2003; Yasmin & Rauf, 2004). The former is the Tanzi-type model of currency-demand, where currency holdings (typically currency in circulation divided by broad money) are modeled by income, interest

rates and an indicator of tax burden, typically using time-series data and standard econometric methods (Kemal, 2003; Yasmin & Rauf, 2004). The second includes more macro-models that incorporate various indicators, including electricity consumption or labour-force participation, occasionally in a multiple-indicators multiple-cause (MIMIC) framework, to estimate the scale of the shadow economy (Schneider & Buehn, 2018). Each of the two methods has its advantages and disadvantages, yet the currency-demand approach is still appealing due to its direct correlation to monetary data and clear modeling of tax-induced cash utilization (Epaphra & Jilenga, 2017; Yasmin & Rauf, 2004).

In the case of Pakistan, early currency-demand literature tended to use annual data until the early 2000s, based on fairly simple functional forms, and tax burden was viewed as an aggregate, lagging, variable (Kemal, 2003; Yasmin & Rauf, 2004). Despite the fact that these models offered a valuable starting point, they failed to reflect the structural developments in the Pakistan economy in the past 20 years, such as financial innovation, digital payments, regulatory reforms, and changes in the makeup of taxation (Younus et al., 2023). Additionally, they seldom differentiated the various types of tax instruments or explicitly considered the intensity of enforcement, documentation or sector-specific policies that can have heterogeneous impacts on cash use, with recent econometric advances, notably the ARDL bounds-testing model and error-correction models, having been effectively used in estimating the money-demand function and macro-relationships in Pakistan (Younus et al., 2023) It implies that recent researches on currency demand and tax burden may use ARDL models to both identify the long-run equilibrium relationship between taxation and currency demand as well as the short-run dynamics of shock adjustment (Ali & Audi, 2018). These models are able to incorporate asymmetric effects, structural break and interactions with variables like financial development, inflation and exchange-rate volatility.

Material and Methodology

The basic idea of the study is taken from Cagan (1958) and then used by Tanzi (1983). The studies used simple monetary approaches as given:

$$\ln(\frac{C}{M2})_t = \beta_0 + \beta_1 \ln(1 + TW)_t + \beta_2 \ln(\frac{WS}{Y})_t + \beta_3 lnR_t + \beta_4 \ln(Y/N)_t + u_t \quad (1)$$

Where β_1,β_2 , $\beta_4 > 0$ and $\beta_3 < 0$. $\frac{C}{M2}$: denotes the currency ratio i.e. ratio of cash held to current as well as deposit accounts. TW: is the weighted average tax rate and is used as a proxy for variations in the magnitude of the underground economy. $\frac{WS}{Y}$: is the ratio of salaries to national income for capturing the impact of changing patterns of holding money and payments. In order to capture the cost of opportunity for cash held R (interest rate on saving deposit is taken.Y/N : represents income per capita."

These studies didn't consider the stationarity of the data into account and therefore the results were spurious. Simple OLS techniques were used to analyze the currency demand equation. In order to dig deep into the matter, the current study flows the method used by Arby et al. (2010) to analyze the currency demand equation and estimate more robust results and a stable model. The study considers the stationarity of the data to analyze the relationship between tax burden while keeping other factors constant. The functional and equational form of the current study is as follows:

CR= f (TGDP, IR, IM, DC, CR (-1))

$$\Delta CR_t = \lambda_0 + \lambda_1 CR_{t-1} + \lambda_2 TGDP_{t-1} + \lambda_2 IR_{t-1} + \lambda_3 DC_{t-1} + \lambda_4 INF_{t-1} + \sum_i^k \alpha_{1i} \Delta CR_{t-1} + \sum_0^k \alpha_{2i} \Delta TGDP_{t-1} + \sum_0^k \alpha_{3i} \Delta IR_{t-1} + \sum_0^k \alpha_{4i} \Delta INF_{t-1} + \sum_0^k \alpha_{4i} \Delta DC_{t-1} + \varepsilon_t \quad (2)$$

The equation shows an ARDL representation of the following 4 relationships:

- The tax burden (tax to GDP ratio (TGDP)) has a positive impact on the currency Ratio (CR) (Tanzi 1983)
- An increase in the Interest Rate (IR) results in a negative effect on the currency ratio (CR) (Tanzi 1983)
- The greater the Inflation (INF) the lesser will be the lessor will be the demand for currency
- The greater the strength of the private sector the lesser demand for cash (Arby et al, 2010)

Where:

CR_t: Is the currency ratio calculated by dividing currency in circulation Mo by broad money M2.

$TGDP_t$; Is the total tax revenue with respect to the GDP at constant LCU

IR_t: is the interest rate

Inf_t: is the inflation. GDP deflator is taken

DC_t: is the domestic credit given by the private sector as a percentage of GDP.

ε_t: is the error term of the model.

Time Period: The study considers time series data spanning from 1979 to 2023

Formulating and Defining Variables

Table 1
Formulating and Defining Variables

Variables	Definition	Abbreviation	Sources
Currency Ratio	It is the ratio of currency in circulation and the broad money (Mo/M2). The ratio shows the total currency (coins, cash, etc.) as a ratio of broad money M2. It is a proxy for demand for currency.	CR	Pakistan's Statistical Yearbook
Tax to GDP ratio	It is calculated by dividing the total tax revenue with GDP. It is a proxy for tax burden.	TGDP	Pakistan's Statistical Yearbook
Interest Rate	It is the weighted average rate of deposits.	IR	State bank of Pakistan
Inflation Rate (GDP deflator)	Estimates the rate of change in prices which are affecting money demand	Inf	World Development Indicators (WDI)
Domestic credit private sector	Reflects development and efficiency of financial institutions in expanding credit access to private entities. It is given as a percentage of GDP.	DC	World Development Indicators (WDI)

Results and Discussion

Augmented Dickey Fuller Test

Augmented dickey fuller test is employed to test for stationarity.

Table 2
ADF Test

Unit root	CR	TGDP	DC	Inf	IR
	Trend and intercept	Trend and intercept	Trend and intercept	Trend and intercept	Trend and intercept
Level	-2.64	-2.405	3.442*	-3.014	-3.934***
First difference	3.337*	-3.831**	3.082	-4.694***	-3.149*

Note: (*), (**), (***) suggest a 10, 5 and 1 percent level of significance

The results of the Augmented Dickey Fuller Test suggest Currency ratio (CR), Tax to GDP ratio and inflation at first difference and interest rate (IR) and Inflation (Inf) at level. Showing a mixed order of integration I (0) and I (1). This mixed form of integration suggests ARDL to be applied.

Optimal Lag selection

The value of (-234.16) for AIC suggests the best fit model according to the given specifications. According to the Akaike Information Criteria, the optimal lags to be included are 1 lag for tax to GDP ratio (TGDP), 2 lags for domestic credit given by private sector (DC), 4 lags for interest rate (IR) and 4 lags for inflation (Inf). Dummy is included as a fixed regressor with no lags. Dummy is included in the model to integrate the impact of covid in the model.

ARDL Short Run Dynamics

Table 3
Dependent Variable: Currency Ratio (CR)

	Coefficients	T-statistics
CR (-1)	0.0245	7.258***
TGDP (-1)	0.9218	1.893*
DC	-0.0035	-2.505**
IR (-4)	-0.00321	-1.939*
Inf (-4)	-0.0006	-2.479**
Dummy	0.0175	1.57
C	0.02	0.789
Multiple R square: 0.97		**Adjusted R square: 0.96**

Note: (*), (**), (***) suggest a 10, 5 and 1 percent level of significance

The value of the coefficient of CR (-1), lag of currency ratio not only shows positive- but also 1% level of significance. This indicates that the lagged values of currency ratio have a pivotal role in determining the present values of currency ratio. A unit increase in the lagged value of CR results in 0.0245 units increase in the present value of currency ratio (CR). The lagged value of tax to GDP ratio is exerting a positive and a significant increase in CR. A one unit increase in Tax to GDP ratio results in 0.9218 unit increase in currency ratio. Furthermore, Domestic credit given by the private sector (DC) also shows a negative and highly significant linkage with the currency ratio at 5 percent level of significance. A one unit increase in the domestic credit given by the private sector DC results in a reduction in -0.0035 units in currency ratio. Meanwhile Interest rate at fourth lag shows a negative and 10 percent level significant relationship with interest rate. One unit increase in the fourth lag of the interest rate results in a reduction of 0.00321 units in currency ratio. Inflation (Inf) also shows a negative yet highly statistically significant relationship with currency ratio (CR). A one unit increase in inflation results in a reduction of -0.006 units in currency ratio (CR). Although insignificant, the positive sign with dummy shows that it is impacting the

currency ratio in the short run. The study also employed dummy variables to account for the impact of covid and global financial crisis. Although not significant but its positive linkage with the currency ratio suggests that the analogy holds.

ARDL Bound test

The bound test (F Test Wald test) as suggested by Pesaran and Shin (2021) shows F statistics to be significant at 10% level of significance. Showing a long run cointegration among variables.

Table 4
Bound Test (Wald Test)

Test Statistic	Amount	Value of K
F-statistic	3.55*	4

Note: (*), (**), (***) suggest a 10, 5 and 1 percent level of significance

It is to be noted that the bound test is achieved only when dummy is taken out of the equation. That is the reason why the value of k is equal to 4.

Long run Dynamics:

Table 5
ARDL Long run Dynamics (dependent variable CR)

	Coefficients	T-statistics
TGDP	4.527	6.6014***
DC	-0.0039	-1.0996
IR	-0.0225	-3.2626***
INF	-0.0044	-1.6356
C	0.0863	0.0863

Note: (*), (**), (***) suggest a 10, 5 and 1 percent level of significance

The long-term dynamic of ARDL, the main variable of investigation, is positive and highly significant i.e. at 1% level of significance. A unit increase in the TGDP (tax burden proxied by tax to GDP ratio) is resulting in 4.527 units increase in the demand for currency. Furthermore, signs of Domestic credit provided by the private sector, interest rate and inflation do construe with the studies in literature. Interest rates are also highly significant and have a negative relation with the demand for currency. A unit increase in the interest rate leads to a reduction of -0.0225 units in the demand for currency.

Residual Diagnostics

Table 6
Residual Diagnostics

Test	DF or Lag	T-statistic	Result
Durbin Watson	-	1.89	No first order autocorrelation
Ljung-Box Q	1	0.083	No autocorrelation
Ljung-Box Q	2	1.915	No autocorrelation
Ljung-Box Q	3	5.43	No autocorrelation
Ljung-Box Q	4	6.08	No autocorrelation
Breusch-Pagan	Df =17	10.81	No heteroskedasticity
Jarque-Bera	N=41	4.02	Normally not rejected

Note: (*), (**), (***) suggest a 10, 5 and 1 percent level of significance

The results of the diagnostic test table suggest that the ARDL model employed is satisfying the main assumptions required for a robust model. The statistics of Durbin Watson is nearer to the optimal value of 2 and the number suggests that we fail to reject the

null hypothesis subject to no autocorrelation of first order. This rejection of the null hypothesis suggests that there is no residual autocorrelation at the first lag. Furthermore, the Q statistic value Ljung-Box Q-test used to detect serial autocorrelation is also suggesting no serial autocorrelation until 4 lags. This also highlights that the serial dependence of the error terms in not at all systematic. The null hypothesis of the Breusch pagan test is rejected. This suggests that there is no concern of heteroskedasticity in the model specification. Lastly, The statistic values of Jarque Bera test 4.029. Hence, the null hypothesis of the residuals distributed normally cannot be rejected. This signifies that the residual of the model is normally distributed. The overall picture looks satisfactory as all the diagnostic evidence highly suggests well specified models with residuals being free of serial autocorrelation and heteroskedasticity and subject to normality. This suggests robustness of the coefficients and validity of econometric results.

Stability tests

Cusum and Cusum square test reveal that the model is stable at 5 percent level of significance

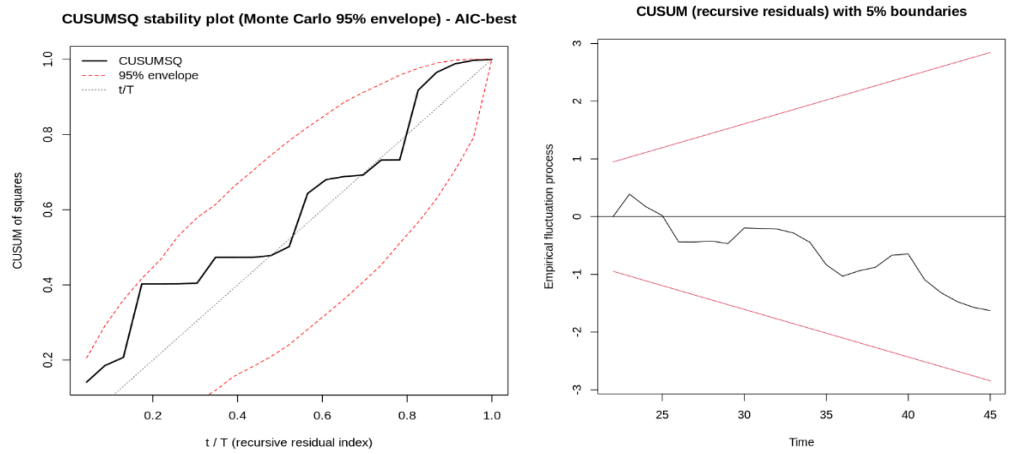

Figure 1: CUSUM and CUSUMSQ

The results of the study are in line with the literature. The analogy that higher tax burden leads to an increase in cash transaction holds true for the study, The tax to gdp ratio (a proxy used for tax burden) has a positive and highly significant relationship with the currency ration CR (measured by dividing currency in circulatiion by broad money). This is highly suggestive that as masses feel burden of tax, they start using currency outside the banking channel to avold or to evade taxes. This has been true for this study for long ad well as short run. This analogy has been supported by Tanzi (1983) and (Arby et al., 2010). Furthermore, the controls used in the study i.e. interest rate, inflation, and domestic credit provided by the private sector are all in line with the previous studies. Interset rate held a highly significant relation with the demand for money and that too a negative one. This shows that as interest rate increases, people like get the best of the opportunity (Arby et al., 2010). Depositing their cash in the bank accounts would reap them more profits. Hence as the interst rate increases the denominator of the currency ratio becomes heavier as compared to the numerator, thereby reducing the demand for currency.

Similarly, as the private sector improves its stronghold in the economy, there is growth, and employment generation. Furthermore, credit provided by the private sector is mostly done through proper banking channels. Hence more domestic credit provided by the private sector results in the reduction in the demand for currency and use of cash for transaction. The proxy used for this (domestic credit provided by the pprivate sector a percentage of GDP) holds an inverse relationship in the short and long run. The relationhip

is significant in the short run and not in the long run (Arby et al., 2010). Inflation also holds a negative relation in the long and short run with the demand for currency (Marthinsen & Gordon, 2022a). This relation is significant in the short run as compared to the long run. The relationship highly supports the argument that with the increase in the price levels of goods and services results in the reduction in the purchasing power of people. This causes a reduction in desire of holding money.

Conclusion

Even though the demand for money is a widely studied topic in monetary economics buts its relationship with tax burden holds immense weightage. This weightage is due to modern societies evaluating the idea of going cashless. The study employs ARDL approach to estimate the relationship between tax burden and demand for currency while controlling for strength of the private sector, inflation and interest rate in Pakistan. The study has revealed that with the increase in the tax burden is not only highly signfucantly increasing the use of cash in the short run but also in the longrun in Pakistan. This tax burden leads to people finding diffent ways to avoid this burden and cash dealing is the best way to do it. This is because cash transaction doesnot leave behing any trail. Futhermore, an increase in the interest rate, inflation and domestic credit provided by the private sector results in a reduction in the demand for currency. Domestic credit provided by the private sector and inflation has a significant and inverse relation with the demand for currency in the short run. This inverse relationship is not significant in the long run. When it comes to interest rate, negative and significant relationship with the currency ratio holds for long as well as short run. The study also employes a dummy variable to account for structural breaks associated with the global financial crisis and covid. Although insignificant, but it held a positive relationship with the demand for currency.

Recommendations

These are the following recommendations that can be followed by the policy makers according to the current study's findings:

- Increase tax base rather than tax rate
- Discourage cash transactions by imposing more taxes on cash transactions and incentivizing electronic currency
- Demonitization followed by stricter financial control might prove fruitful
- Improved and easy banking system or promote transactions

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