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Investigating the Relationship Between Money Laundering And Inflation in Pakistan

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ABSTRACT

The aim of the study was to estimates the amount of money laundering and to estimate its effect on inflation in Pakistan. Firstly, the study estimated the amount of money laundering in Pakistan for a period of 1960-2014. It was found that about 3.8% of the Pakistan's gross domestic product (GDP) was laundered in 1998 while in 2014 it was approximately 20% of GDP. For examining the relationship between estimated amount of money laundered and inflation in Pakistan, national consumption, investment, value added tax and employment rate were taken as control variables. Using the Auto-regressive Distributive Lag (ARDL) model, it was found that money laundering affected the inflation rate positively; as when there was an increase in the amount of money laundering by 1%, it increased the inflation rate in the economy by approximately 22%. The empirical results of the present study revealed that money laundering was one of the key factors contributing to high inflation rate in the economy. Hence, it is suggested that the prevailing Money Laundering Act (MLA) in the country should be strengthened and enforced strictly for controlling the inflation rate.

INTRODUCTION

It is pertinent to answer the question such as "*What exactly Money Laundering is?"* prior to estimating the money laundering (*ML*) amounts and its effects. In Pakistan, the term money laundering is generally referred to transfer of money across the borders. However, some organizations and individuals have defined the term money laundering according to their respective disciplines. Existence of several definitions made it even more ambiguous for the readers to have a clear point of view of the subject matter. Different organizations including Financial Action Task Force (FATF), International Monetary Fund (IMF) and scholars from different disciplines like; Economics, Law and social sciences define the term money laundering in their own way. Masciandaro (1998) defined the money laundering as *"Money laundering is the process by which the proceeds of crime (dirty money) are put through a*

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series of transactions, which disguise their illicit origins, and make them appear to have come from a legitimate source (clean money)".

There has been a confusion among many people between money laundering and the underground economy. Some researchers believe both money laundering and underground economy are the same, while others disagree and argued that there is difference between them. The total revenues received from illegal activities are considered underground economy while the part of total illicit revenues (received from criminal or illegal activities) which has been whitewashed is considered the Money Laundering (Masciandaro, 2004).

Money laundering (ML) has attained more attention since the September 11, 2001 terrorist's attacks on US. Many governments have formulated policies to combat the menace of money laundering. These policies are coordinated with other countries for enforcement to avert finances to terrorist organizations at a global level. The Organization for Economic Cooperation and Development (OECD), The Bank of International Settlement (BIS), International Monetary Fund (IMF), G-8 and G-20 countries, World Bank (WB), several departments in United Nations, and Financial Stability Forum (FSF) have placed regulatory measures for combating money laundering. Financial Action Task Force (FATF) issued a set of forty recommendations which played a vital role in establishing international standards for controlling and combating money laundering.

Pakistan has been at the center of many financial crimes like smuggling, narcotics trafficking, tax-evasion, fraud, corruption and terrorism. Pakistan is a massive drug-transit country because of its porous borders; porous borders are a source of encouragement for transfer of illegal goods to the province of Baluchistan, formerly known Federally Administered Tribal Areas (FATA) and other parts of the country. Afghanistan Transit Agreement (ATA) also allows goods especially electronics, building materials, food items and many others to freely enter Pakistani markets without any paid duty. All these smuggled and duty-free goods are illegally sold in Pakistan and can generate an enormous sum of revenues which could lead to money laundering.

Criminal networks in Pakistan play an important role in the shipments of smuggled goods, narcotics, and humans from Afghanistan to international markets. Some of the common methods of money laundering are smuggling, charitable sector abuse, *hawala*/*hundi*, cross border transfer of cash and trade-based laundering. According to conservative estimates, the *hawala*/*hundi* business in Pakistan

was about 15 billion dollars in 2015. In Pakistan, money laundering emerged as a public issue when famous fashion model Ayyan Ali was arrested by Pakistan's Airport Security Forces at Benazir International Airport in Islamabad on 14 March 2015[*]. Ayyan Ali was carrying an amount of US $506,800 to Dubai through a private airline. The amount she was carrying exceeded the legal limit of cash carrying of US $ 10,000. Further, Pakistan has been continuously pressurized by the Financial Action Task Force (FATF) overtime and has been kept in grey list of countries. The FATF has asked Pakistan to take measures and formulate policies before it is given a clean chit and placed among the countries of white list.

State Bank of Pakistan (SBP) has framed several legislations to target money laundering in the country. Anti-Money Laundering (AML) Ordinance was promulgated in Pakistan in 2007. Several departments are established for reducing the illicit flows of money in the country. Financial Monitoring Unit (FMU), Federal Investigation Agency (FIA), Anti-Narcotics Force (ANF), Custom Intelligence and Investigation (CII) and National Accountability Bureau (NAB) in Pakistan are all entrusted with the enforcement of Anti-Money Laundering Ordinance[†].

There is a consensus that AML ordinance has not been effective in the country. There is also a general perception that the government of Pakistan needs to re-visit the existing Anti-Money Laundering Ordinance to make it fully in compliance with international standards. The enforcement of the ordinance may also be strengthened to ensure its full implementation. There are four different approaches which tried to estimate the amounts of money laundering and its possible impacts on overall economy. These approaches include; (i) Walker (1999) who estimated the amount of trade based money laundering (ii) direct approach by Masciandaro (2004), (iii) indirect approach by Quirk (1996) and (iv) FATF (2006) used multi-indicators and multi causes (MIMIC) model.

After reviewing all the available relevant literature on money laundering in Pakistan, it is found that there has been some research explaining the terminology, processes and methods of money laundering in Pakistan. However, there has not been a single study to estimate the amounts of the money laundering and its correlation with other macroeconomic variables in Pakistan. Further, there has been

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[*]Detained model spills ‘money-laundering beans". *The Nation* (Pakistan). 15 March 2015. Retrieved 21 December 2015

[†] State Bank of Pakistan (SBP) Annual Report (2007).

a few research studies (Walker 1999, Masciandaro 2004, Quirk 1996, and FATF 2006) conducted to estimate the amount of money laundering for various countries. Furthermore, laundered money makes a way into the financial sector, increases the money supply in the economy. Therefore, it is also important to study the possible effects of additional undocumented money on the inflation and other macroeconomics variables. Hence, the present study aims to estimate the extents of money laundered in Pakistan and to test a relationship between the amounts of money laundering and inflation in the Pakistan's economy.

LITERATURE REVIEW

The main objectives of the study are to estimate a series of money laundering data for the time period 1961-2014 and to test the relationship of money laundering with inflation for Pakistan economy. Therefore, this section of the research highlights the three kinds of literature available on money laundering; (1) the descriptive studies on money laundering, (2) the literature previously conducted on the estimation of the amounts of money laundering, and (3) the empirical effects of money laundering on macroeconomic variables specifically inflation.

MacKrell (1997) stated that laundering is associated with the crimes like theft, drugs, fraud, and tax evasion. This implies that the resources are unfairly transferred from victims to criminals. After having the ill-gotten money, it needs to be whitewashed. Furthermore, the author stated that money laundering makes the crime worthwhile. It gives economic power to criminals usually taken away from the law abiders. Once money is illegally transferred from victims to criminals, it distorts the consumption pattern (Meloen *et al*. 2003). The argument is based on the fact that the victim might have intended using the money for daily consumption, old age, and rainy days. However, criminals might use the money on luxurious goods such as purchase of diamonds, cars, and jewellery.

Money launderers are primarily interested in the ways to escape from detection rather than maximization of profit consideration. Barlett (2002) argued that the money launderers choose those kinds of projects for investment purposes which provide the highest level of concealment rather than high profits. Furthermore, the author argued, those investments can be detrimental to the economy because it diverts the resources to such assets which create little economic activities and low employment. Similarly, the money launderer care less about the rate of return and are more concerned with the level of recycling of the ill-gotten money (McDowell, 2001). Consequently, they are willing to

pay more than the market price for any asset because it provides the opportunity to disguise the origin of the illicit revenues as well as it may increase the share of the launderer in any specific economy. The process may also result in increase in prices. Furthermore, the artificial increase in lands prices in Colombia of 1980s was a major cause of money laundering in the country. Similarly, the process can work in the capital market investment too (Keh, 1996).

The Gresham's law states that "bad money drives out the good money". In this regard, Walker (1995) stated that the law can be applied to money laundering too. Money launderer pays higher prices for asset as stated by Keh (1996) as the primary goal of the launderer is to avail the opportunity of concealment. Thus, the purchase prices of the assets go up. Hence, the launderers can make the asset unaffordable for potential buyers. Thus, they may outbid the honest investors from the market. This process leads to an unfair competition. Normally this happens in assets which looks more legitimate such as real estate, bonds, saving certificates, and business. Arlacchi (1986) argued while discussing the anti-competitive business of mafia that the legal firms of the mafia have more means of finances than non-mafia firms. The mafia can channelize their ill-gotten money into their legal enterprises. On the other hand, the non-mafia firms face financial constraints. Furthermore, the lack of credit may squeeze the non-mafia firms and therefore, either they may be working in subordination to the mafia firms or get out from the market. This process may lead the market to an unfair competition.

Money laundering can also distort a country's imports and exports. Barlett (2002) found that the money launderer especially in developing countries gets engaged in expensive commodities normally imported goods. Consequently, they affect the balance of payments of a country. Such changes don't contribute to the domestic economic activities. This may depress the domestic prices and thereby reducing the profitability of domestic enterprises. Baker (1999) argued that money laundering in any country affect the prices of import and exports. Furthermore, he stated that one of the reasons of illegal capital outflow is overpricing imports and underpricing exports.

Barlett (2002) stated that money laundering affects the economic growth negatively. He made his argument by asking a question as to how the funds are redirected from safe and healthy investments to risky ones. Money launderer put a huge sum of investment into a risky project and the rest of the investors in the market follow the launderer decisions too and therefore the spillover is created. Investment in risky investment projects might affect the economic growth inversely. McDowell (2001)

stated that when in a specific economy the industries don't appeal to the launderer, they simply abandon it. They can cause a potential collapse of a specific sector. Thus, this causes a potential threat to the economic growth. Similarly, Tanzi (1996) argued that money laundering affects the financial institutions which are crucial for economic growth as well as it also affect the economic growth by misallocation of the resources in the economy. These statements have been substantiated by the work of Quirk (1997) as well. He empirically investigates 18 industrial countries for the period 1983-1990 and found that reduction in the annual economic growth was associated with the increase in money laundering. On the other hand, Bagella, Becchetti and Lo Cicero (2004) stated that when ill-gotten funds are transferred from originating country to another, then funds receiving country doesn't bear the consequences of the crime which generate the funds in any way. Additional value-added services can be created in the receiving country with or without bearing any cost of crime. It can benefit the receiving country. Hence, the effect of money laundering on economic growth can be positive too.

Money laundering can affect the output, employment and income in different ways. Walker (1995) applied the input-output model for measuring these effects. He specifically stated that when the funds are invested in projects such as in dwelling properties, it decreases the output, employment and income by a significant amount. Alldridge (2002) stated that money laundering causes a decrease in the government revenue as launderers seek ways to hide the illicit origin of the generated revenues. Underreporting or misrepresenting the income is one of the common methods of money laundering. Consequently, money laundering affects the government tax revenue inversely. In addition, McDonell (1997) stated that money laundering increases the government expenditures on enforcement purposes. This leads to an increase in the tax burden on public. Furthermore, money laundering can also increase the public revenue as the launderer may be willing to pay taxes in order legalize the ill-gotten money. The launderer might be ready to pay the taxes on the amount without any investigation of the origin of the funds. President Musharraf regime in Pakistan in the 2007 offered National Reconciliation Ordinance (NRO), which provided amnesty to politicians, judges, bureaucrats in corruption and other offences. Secondly, in 2016, Finance Minister of Pakistan presented the bill in the parliament stating that all taxpayers and non-tax payer can whiten their money by paying just one percent tax without any investigation into the origin of the money. These kinds of policies facilitated the launderer to disguise the origin just by paying considerably small proportion in the form of taxes on the ill-gotten money.

Money launderer normally tends to place the funds in such a country where the financial

authorities don't inquire the origin of the funds. Tanzi (1997) argued that this could cause a high capital flight from countries with sound and effective economic policies to countries with inefficient and weak economic policies. On the other hand, Keh (1996) argued that money laundering could also have the reverse effects on any specific economy. For example, a large amount of ill-gotten money can be beneficial for a specific economy as it increases the foreign reserve, alleviating some specific difficulties in reducing the expenditures on policies and decreasing the foreign debt.

It is obvious that money laundering distorts economic statistics. Tanzi (1997) is of the view that huge amount of laundering activities would bring inaccuracies in the macro-economic statistics. Subsequently, it may lead to formulating policies not based on actual statistics. Walker (1999) used gravity model of international trade to estimate the amount of money laundering. An empirical input and output model was used for estimating the amount of money laundering and its flow to specific countries. The study found that around 2.85 trillion dollars were laundered globally. Similarly, Ardizzi, Petraglia, Piacenza and Turati (2014) developed currency demand approach for estimating the amounts of money laundering for the Italian Economy. They formulated the model by incorporating three different components; (1) money laundering component like illegal traffics and extortion, (2) structural component like per capita income and payment technology and (3) shadow economy component that represented the presence of undocumented workers and financial tax frauds. They utilized the panel data of Italy's provinces and estimated the equation for cash inflow. They estimated the restricted model by hypothesizing some variables equal to zero. They reported that the difference of restricted model from unrestricted model gave the amount of money laundered. They found that about 6 percent of gross domestic product was laundered in Italian economy of which about 5 percent was attributed to illegal trafficking and 1 percent to extortions.

Argentiero, Bagella and Busato (2008) incorporated the firm and household optimality conditions for generating the money laundering series for Italy. They employed the methodology of Busato, Chiarini and Di Maro (2006) for generating underground economy. They postulated that the un-observed components of the economy which measures the friction of money laundering to be a function of the prices of the legally produced good and illegally produced good, labour input, capital input, consumption of the legally produced good and ratio of criminal economy to world GDP. They found that around 12 percent of the gross domestic product in Italy was laundered in 2006.

Walker (1995) investigated the effects of money laundering on income, output, employment and imports. He found that when money was transferred from victims to criminals of about US 1 million dollars and invested in real estate; that decrease the demand for necessary commodities like food and clothing resulting in loss of US 2.877 million dollars in output, 692,000 in wages and salaries and 34 jobs. On the other hand, the increase demand for real estate increased the output by 2.611 Million US dollars, 7860,000 extra salaries and wages and created new 29 jobs. The net impacts were a loss of 266,000 US dollars in output and 5 jobs while a gain of $94,000 in salaries and wage.

Quirk (1996) investigated the effects of money laundering on the demand for money. The study used data for 18 industrialized countries for the time-period 1983-1990. Money demand was affected significantly positive by the money laundering variables when government consumption expenditures were included in the model. Similarly, Quirks (1996) used the human capital in the model with a proxy for money laundering. The study empirically investigated the relationship of money laundering and economic growth. The findings of the study suggested a negative relationship between economic growth and money laundering. Quirk (1997) conducted another study by employing the data of 18 industrialized countries for the period of 1983-1990. This study reported that there was a strong negative correlation between annual growth rate and money laundering. The literature on the money laundering is of three types: the one type deals with the estimation of the amounts of money laundering (Walker, 1995; Masciandar, 1998; Masciandar, 2004; Argentiero et al., 2008 & Ardizzi et al., 2014). The second type of literature describes rationally the relationship of money laundering and other macro-economic variables, and the third type is the literature which links the money laundering estimated data with other economic variables and investigates the relationship empirically (Bloomberg, Hess & Orphanides, 2004; Quirk, 1996; Quirk, 1997; Walker, 1995 & Walker 1999).

Most concern in the money laundering literature is given to three specific main effects. Firstly, the economic effect of misallocation of the resources by means of price distortion is studied. For securing their funds, income or business, launderers need to pay more than the market prices in order to avail the opportunity of disguising the illicit origin of the funds. Secondly, the social effect of destroying integrity and reputation of financial institutions and its long-term consequences in the form of increase in bribery, decline in foreign aid and foreign direct investment, corruption, and thus hindering the development of the financial institutions is investigated as well. The third concerned effect that is examined is the undermining of state authorities and democratic process by infiltrating the political, financial and social

institutions by criminals and criminal organizations. In previous literature review, we found that not a single study has been conducted to estimate the amount of money laundering and specifically its effect on the macroeconomic variables in case of Pakistan economy. This gap is filled in this study. In the next section, we present the theoretical model that will be used later in section 4 for the empirical analysis and results.

MATERIAL AND METHODS

We follow the methodological approach developed by Argentiero et al. (2008). The model includes two economic agents: firms and households. The model assumes that there are a large number of homogeneous firms that produce two commodities: legal commodity (C_1) and illegal commodity (C_2). The firms pay tax on the legal commodity while evade tax on illegal commodity. The model assumes that there are homogeneous labour in the economy, which work in both sectors, formal sector and informal sector. The government levies a proportional tax on the generated revenues, income flows and formal sector consumptions flows.

Consider an economy comprises of a large number of identical and homogeneous households; live forever and are having identical preferences over consumption and labor inputs at every period of time. The utility function is given as follows:

$$u = \eta\left(\frac{C_{1t}^{1-q_1}}{1-q_1}\right) + (1-\eta)\left(\frac{C_{2t}^{1-q_2}}{1-q_2}\right) - B\left(\frac{(1-N_t)^{1+\psi}}{1+\psi}\right) - Z_t C_{1t} \quad ----------(1)$$

Where, C_1 is the consumption of legally produced good with the fraction η; C_2 is the consumption of illegal produced good with the fraction $(1-\eta)$, q_1 is the weightage of legal commodity and q_2 is the weight given to illegal produced good. Z_t is the ad-valorem tax imposed on the regular economy good C_1.The term $B\left(\frac{(1-N_t)^{1+\psi}}{1+\psi}\right)$ is the idiosyncratic cost (idiosyncratic cost is the penalty paid after getting caught working in illegal sector) of working in the illegal economy which creates a specific disutility in the utility function.

Suppose that many homogeneous firms operate in the economy producing two goods C_1 and C_2. Commodity C_1 is produced by a technology, which exhibits constant return to scale by employing labour (N) and capital (K). The produced commodity is either consumed or invested for capital accumulation. Commodity C_2 is also produced by a constant return to scale technology but this commodity can only be consumed; the good is produced by labour input ($1-N$) and fixed land $\bar{L}$; the functional form of

technologies can be written as;

$$K_{t+1} + C_{1t} = \Lambda_t N_t^{\beta} K_t^{1-\beta} \quad (2)$$
$$C_{2t} = \Lambda_t (1-N)_t^{\alpha} \bar{L}_t^{1-\alpha} \quad (3)$$
$$I_t = K_{t+1} \quad (4)$$

Where, Λ_t is the total factor productivity and investment (I) in time (t) is equal to capital accumulation (K) in time ($t+1$). The household have the options to hold cash (M) or capital; it is assumed that the government levies ad-valorem tax (τ) on commodity C_1, therefore, the budget constraint is given as;

$$P_{1t}[K_{t+1} + C_{1t}] + P_{2t}C_{2t} + M_{t+1} = \Lambda_t P_{1t} N_t^{\beta} K_t^{1-\beta} + \Lambda_t P_{2t}(1-N)_t^{\alpha} \bar{L}_t^{1-\alpha} + \tau_t + M_t \quad (5)$$

Where, in equation (5) P_1 and P_2 are the current prices of consumption of commodities C_1 and C_2 respectively in time t. τ is the lump-sum government transfer at time t. The Lagrangian Multiplier could be written as follows:

$$\underset{\substack{\{C_{1t},C_{2t}\}_{t=0}^{\infty} \\ \{N_t,K_{t+1}\}_{t=0}^{\infty} \\ \{M_{t+1},\mathfrak{x}_t\}_{t=0}^{\infty}}}{Max} L = E_0 \sum_{t=0}^{\infty} \phi^t \left[\eta \left(\frac{C_{1t}^{1-q_1}}{1-q_1} \right) + (1-\eta) \left(\frac{C_{2t}^{1-q_2}}{1-q_2} \right) - B \left(\frac{(1-N_t)^{1+\psi}}{1+\psi} \right) - Z_t C_{1t} \right.$$
$$+ \lambda_{1t} \left\{ \Lambda_t P_{1t} N_t^{\beta} K_t^{1-\beta} + \Lambda_t P_{2t}(1-N)_t^{\alpha} \bar{L}_t^{1-\alpha} + \tau_t + M_t - P_{1t}[K_{t+1} + C_{1t}] - P_{2t}C_{2t} \right.$$
$$\left. - M_{t+1} \right\} + \lambda_{2t} \{ P_{1t}C_{1t} - \bar{M}_t + P_{2t}C_{2t} - \mathfrak{x}_t (P_{2t-1}C_{2t-1}) \}$$
$$\left. + \lambda_{3t} \{ P_{2t}C_{2t} - (1-\mathfrak{x}_t)(P_{2t-1}C_{2t-1}) - \bar{M}_t \} \right] \quad (6)$$

The solution of constrained Pareto problem yields the following equation; which, could be used for estimating the amounts of money laundering.

$$\mathfrak{x}_t = \frac{1}{2} \frac{P_{1t}C_{1t}}{\frac{B(1-N_{t-1})^{1+\psi} \lambda_{1t-1} P_{1t-1} \beta N_{t-1}^{\beta-1} K_{t-1}^{1-\beta} N_{t-1}}{\alpha \lambda_{1t-1}}} \quad (7)$$

Equation (7) states that; the optimal fraction of the money laundering is a function of labour services allocated to formal and informal sectors, capital allocation to legal sector, and the prices of both commodities. Furthermore, the research investigates the effects of money laundering on inflation. Hence, the present study specifies the functional form as follows.

$$P_{1t} = \int (\mathfrak{x}_t, P_{2t}, N_t, K_t, C_{1t}, C_{2t}, Z_t) \quad (8)$$

Where, P_{1t} and P_{2t} are the prices of the legally produced good and illegally produced good respectively and are represented with the consumer price index, N_t is labour input represented by the

employment rate, K_t is the capital input in production process, C_{1t} is the consumption of the legally produced good and it is taken as the national consumption while C_{2t} is estimated as the ratio of criminal economy and world *GDP* multiply with hundred. Hence, we would consider the C_{2t} as a share of national consumption. $Z_t$is the ad-valorem tax, which is calibrated with the value-added tax (*VAT*). We expect that money laundering is positively associated with the inflation rate as money laundering add to exiting official money supply and thus it is tested. Therefore, the empirical model is given as follows:

$$CPI_t = \beta_0 + \beta_1 ML_t + \beta_2 NC_t + \beta_3 VAT_t + \beta_4 INV_t + EMP_t + \beta_5 + \nu_t \quad (9)$$

CPI: Inflation is measured as the consumption basket price and the data has been collected from World Development indicators (WDI) adjusted for 2005 US dollar.

ML: Money Laundering and the data have been estimated in this research.

NC: National Consumption is measured as the sum of Public and Private Consumption. The data has been collected from World Development indicators (WDI) in constant 2005 dollar.

VAT: Value added Tax has been used as a proxy for Ad-valorem tax. The data is collected from World Band Data catalogue in constant 2005 US dollar.

INV: Gross Fixed Capital Formation is used as a proxy for Investment. The data on this variable is collected from World Development Indicators (WDI).

EMP: Employment rate, the data has been collected from Asian Development Bank (ADB). The data is in percentage of total labor force.

$\beta_1$is the drift and $\beta_2, \beta_3, \beta_4, and\ \beta_5$ are the co-efficient of *ML, NC, VAT, INV* and *EMP* while ν_t is the random term which follows the assumption of white noise and *t* represents time period (1961, 1962, . . . 2014).

Since this research uses the time series data, therefore, on the bases of Augmented Dickey Fuller (*ADF*) test, the present study chooses an appropriate time series econometric technique for estimation purpose. The ADF test results are given in table 1.

TABLE 1: AUGMENTED DICKEY-FULLER TEST

Variables	ADF-Stat. *I (0)*	Probability	ADF-Stat. *I (1)*	Probability
CPI	-0.79	0.81	-8.91	0.00
ML	0.13	0.96	-4.96	0.00
NC	3.12	1.00	-6.09	0.00
VAT	-3.787	0.00	--	--
INV	-0.55	0.87	-5.29	0.00

EMP	-3.12	0.03	--	--

Augmented Dickey-Fuller (*ADF*) test on each variable is applied and the results are given in the above given table. Inflation (CPI), Money Laundering (*ML*), National Consumption (*NC*) and Investment (*INV*) are integrated of order one [*I (1)*]. On the other hand, Value Added Tax (*VAT*) and employment rate are integrated of order zero [*I (0)*]. When the data is a combination of *I (0) and I (1)* then, Enders (2009) stated that the best econometric technique is Auto-Regressive Distributive Lag (ARDL) model for estimating the parameter of the regression equation (9). Pesaran, Shin and Smith (2001) introduced ARDL model for incorporating *I(0)* and *I(1)* variables in the same regression.

Following the Autoregressive Distributive Lag (ARDL) model specification we formulated ARDL (p, q, r, s, u, v) for this research as follows:

$$CPI_t = \beta_0 + \sum_{i=1}^{p} \beta_1 CPI_{t-i} + \sum_{i=1}^{q} \beta_2 ML_{t-i} + \sum_{i=1}^{r} \beta_3 NC_{t-i} + \sum_{i=1}^{s} \beta_4 VAT_{t-i} + \sum_{i=1}^{u} \beta_5 INV_{t-i} + \sum_{i=1}^{v} \beta_6 EMP_{t-i} + \varepsilon_t \quad ----------(10)$$

Where β_0 is the drift and $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ and β_6 are the co-efficient of CPI lag value, ML, NC, VAT, INV and EMP while ε_t is the random term which follows the assumption of white noise and t represents the time. Pesaran and Pesaran (1997) argue that for the stability of long-run co-integration co-efficient it is important to test the short run co-efficient of the model especially for such a small sample size. For equation (9) we formulated the short-run dynamics normally known as Error Correction Model (*ECM*) given as follows:

$$\Delta CPI_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta CPI_{t-i} + \sum_{i=1}^{q} \beta_2 \Delta ML_{t-i} + \sum_{i=1}^{r} \beta_3 \Delta NC_{t-i} + \sum_{i=1}^{s} \beta_4 \Delta VAT_{t-i} + \sum_{i=1}^{u} \beta_5 \Delta INV_{t-i} + \sum_{i=1}^{v} \beta_6 \Delta EMP_{t-i} + \psi ECT + \varepsilon_t \quad -----(11)$$

Where ψ is the parameter of error correction term (*ECT)* which indicates the speed of adjustment or correction in the short run equilibrium for the long run co-integration. The error correction term (ECT) needs to be negative and significant. While Δ represents the change and the remaining variables and all other co-efficient are the same as discussed earlier. The joint significance of short-run parameters will be tested with the help of Wald test.

RESULTS

Augmented Dickey–Fuller test was used for checking the Stationarity in the series for estimating the production function. The test statistics are given in Table 2.

TABLE 2: AUGMENTED DICKEY-FULLER TEST

Variable	ADF-Statistic	Critical value at 5%
LNGDP	-3.14	-2.91
LNK	-2.95	-2.91
LNL	-5.92	-2.91

The null hypothesis of the ADF-test is that H_0: the series has unit root; meaning that the series is non-stationary. On the other hand, the alternative hypothesis states that H_1: the series does not have unit root. In the above table we presented the variables, ADF-test calculated statistic and critical value at 5%. All the variables are stationary at 5% level.

After testing for Stationarity, we estimate the restricted Cob-Douglas production (where restriction is $\alpha+\beta=1$) and the results are presented in Table 3 as follows:

TABLE 3: ESTIMATION OF COBB DOUGLAS PRODUCTION FUNCTION

Variables	Coefficient	Std. Error	Prob.
Constant	-9.254	0.27	0.00
Labour (L)	0.627	0.02	0.00
R-Square	0.74	D-W test	1.28

The dependent variable is GDP; the independent variables are capital (*K*) and labor (*L*) in the production function. Capital (*K)* has not been shown in the E-views results because of the imposed restriction. However, we can find the co-efficient of Capital by subtracting the co-efficient of Labour (*L*) from 1. The co-efficient of Labour (*L*) is 0.627 and it is significant at 1% level. The co-efficient of Capital (*K*) is (1 - 0.627 = 0.373). Furthermore, we test the Heteroscedasticity and Auto-correlation in the model; the model doesn't have the problem of either Autocorrelation or Heteroscedasticity. The results are given in Table 4.

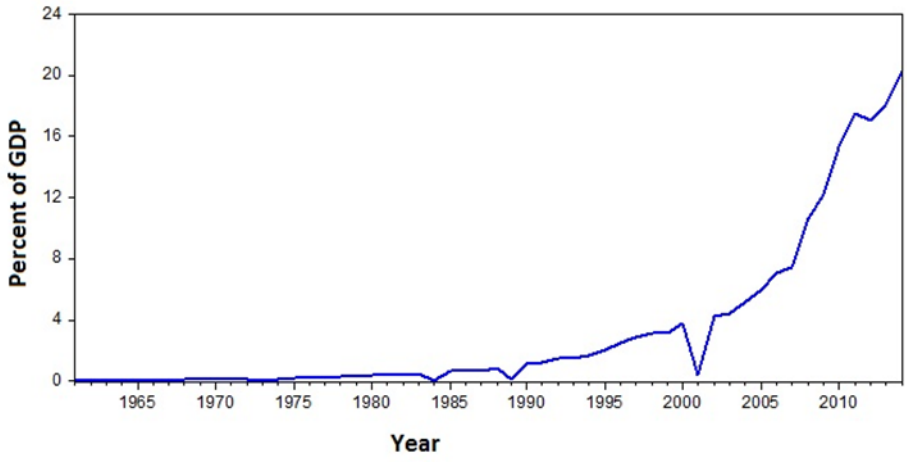
TABLE 4: AUTO AND HETEROSCEDASTICITY TEST RESULTS

Test	Observed R-Square	Probability value
Auto-Correlation	4.291	0.117
Heteroscedasticity	0.145	0.929

For Autocorrelation we used Breusch-Godfrey Serial Correlation LM Test. The Null hypothesis is given as; H_0: There is no Autocorrelation in the model. The probability of observed R-Square is greater than 5% therefore, we fail to reject null hypothesis. For Heteroscedasticity, we use White test; the null hypothesis of White test states; H_0 the model is not heteroscedastic. The probability value of the observed R-square is 92.9 percent which is greater than 5%. Hence, we can't reject null hypothesis.

Estimation of Money Laundering

The capital share in production sector is set equal to 0.62, and labour share is set equal to 0.37. In a broad sense, we will use interval for both variable. For capital (K) share β we will use 0 – 0.373 and for labour (N) share, we will use interval (0 – 0.627). The elasticities of substitution of both commodities C_1 and C_2 (q_1 and 1- q_1) and (q_2 and 1- q_2); both are set equal to 0.01 and 0.99 respectively for having a stable solution. On the other hand, the labor supply and disutility parameters follow the analysis of MacCurdy (1999). Specifically, following the study of MacCurdy, we simulate $\boldsymbol{\psi = 1.6}$, $\boldsymbol{\alpha = 0.09}$ and B = 9. Furthermore, realistically we suppose that the consumption of legal good C_1 is more in the economy as compare to illegal good C_2 following the study of Argentario et. al (2008). Therefore, the share of legal good (η) is set equal to 0.9 and share of illegal good consumption ($1 - \eta$) is set equal to 0.1 in the agent's utility function. The estimated values of money laundering in Billions (*MLB*) in Pakistani Rupees (PKR) and as percentage of gross domestic product (GDP) are shown in Figure 1 and Figure 2 respectively



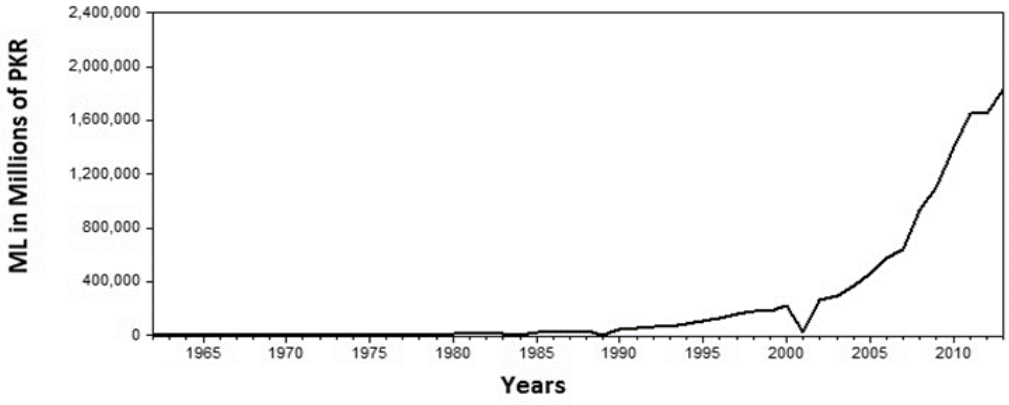


FIGURE 1: MONEY LAUNDERING AMOUNTS IN MILLIONS PKR

FIGURE 2: MONEY LAUNDERING AS A PERCENTAGE OF GDP

Money laundering has been rising from 1991 as evident in the figures 1 and 2. In 1999, the money laundering accounted for approximately 3.8 percent of GDP. With the formation of National Accountability Bureau (NAB) in November 1999, the amounts of money laundering dramatically decreased in 2000. On the other hand, with 9/11 terrorist's attacks in USA, the amounts of money laundering showed a sudden increasing trend in Pakistan which has been further strengthened by the war against terror in Afghanistan. During this time, the frequent cross border movements of the refugees also exacerbated the money laundering. Recently, in 2016 Panama papers identified, that more than 259 Pakistani nationals are the shareholders of offshore registered companies. Specifically, 80 companies are solely owned by Pakistani citizens, including families of high officials, businessmen, Politicians,

media persons, Judges, etc. the Panama Papers showed a detailed record of the companies including net worth of the shareholders. There have been strong indications that there have been huge amounts of money laundering to set up those offshore companies. In 2014, different sources identified that money laundering in Pakistan has increased many fold since the start of war against terror as well. In our study money laundering accounted approximately 20 percent of the GDP in 2014.

Impact of Money Laundering on Inflation

As the present study established that auto regressive distributive lag (ARDL) model would be the appropriate method of estimation to test the relationship between the money laundering and inflation. The results of preliminary regression are given in Table 5.

TABLE 5: ARDL PRELIMINARY ESTIMATION RESULTS

R-squared	0.99	Adjusted R-squared	0.97
F-statistic	80.47	Probability (F-statistic)	0.00
Durbin-Watson stat	2.22	Akaike info criterion	1.81

The preliminary regression results indicate that the model is a good fit as the R-square value is 0.99 while the Adjusted R-square value is 0.97. After preliminary estimation we run bounds test for testing the long-run co-integration. The test specifically investigates the effects of explanatory variables on dependent variable in long-run by comparing the calculated F-statistic value with the upper and lower bounds values. The test results are given in the table 6 as follows.

TABLE 6: ARDL BOUNDS TEST RESULTS

Bounds Test	**F-statistic**	**Lower bound at 5%**	**Upper Bound at 5 %**
F-statistic	4.19	2.62	3.79

The Bounds test results states that there exists the long run con-integration among explanatory and explained variables as the estimated F-statistic is greater than the upper bounds critical value. Further, we test the model for Heteroscedasticity and Auto-correlation i) No Auto-Correlation and ii) Homoscedastic error term, results are presented in Table 7 as follows.

TABLE 7: AUTOCORRELATION AND HETEROSCEDASTICITY TEST RESULTS

	Observed R^2	Probability
Serial Correlation LM Test	1.14	0.52
White test of heteroscedasticity	2.56	0.46

We apply Serial correlation LM test for checking the Autocorrelation in model. The test results confirmed that the model is free from autocorrelation as the probability of observed R^2 is greater than 5 percent; in other words, we cannot reject the null hypothesis of Serial Correlation LM test (there is no auto correlation in the model). On the other, heteroscedasticity is normally the problem in cross sectional data. However, we run the Auto-Regressive Conditional Heteroscedasticity (*ARCH*) test for confirming that the error terms in model are homoscedastic. The test results confirm that the variance of the error term in the model is homoscedastic as the null hypothesis of the test cannot be reject on basis of probability (*P>0.5).*

After performing the model diagnostic tests, we present short-run and long run results of Auto-Regressive Distributive Lag (ARDL) model. Specifically, we are interested in estimating the long-run results but according to Pesaran and Pesaran (1997) the validity of Long-run results of the ARDL based estimation depends on significance of short run and error correction term (*ECT*). Therefore, first we presented the short-run estimation results along with error correction term and co-integrating equation. For testing the joint significance of the lag values of the variables we apply the Wald test, comparing the calculated F-Statistic with the tabulated values given on certain significance level. The results are presented in table 8.

TABLE 8: ARDL SHORT-RUN RESULTS, ECT AND BOUNDS TEST RESULT

	Cointegrating Form		**Wald –Test**	
	Coefficient	**Std. Error**	**F-Statistic**	**Prob.**
D (CPI (-1))	1.17	0.44	3.78	0.01
D (CPI (-2))	1.20	0.45		
D (CPI (-3))	1.03	0.41		
D (CPI (-4))	1.13	0.42		
D (CPI (-5))	0.86	0.41		
D (CPI (-6))	0.58	0.38		
D (CPI (-7))	0.56	0.37		
D(ML)	0.32	0.10	4.94	0.01
D (ML (-1))	-0.34	0.14		

D (ML (-2))	0.16	0.13		
D(NC)	0.01	0.04	2.92	0.06
D (NC (-1))	0.16	0.07		
D (NC (-2))	-0.17	0.09		
D(VAT)	0.26	0.74	4.74	0.01
D (VAT (-1))	1.29	0.76		
D (VAT (-2))	-2.00	0.83		
D(INV)	-0.19	0.24	1.15	0.35
D (INV (-1))	-0.38	0.30		
D (INV (-2))	0.45	0.22		
D(EMP)	-0.06	0.37	2.88	0.08
D (EMP (-1))	0.53	0.44		
CointEq (-1)	-0.97	0.32	**Probability**	0.00

Cointeq = CPI - (0.2170*ML + 0.0858*NC + 0.9348*VAT - 0.2443*INV-0.4226*EMP + 12.6126)

The results in Table 8 depict the parameters value of lag variables and explanatory variables. In the short run, consumer price index (*CPI*), money laundering (*ML*), and value added tax (*VAT*) are found significant. Further, national consumption (*NC*) and employment (*EMP*) are only significant at 10 percent. Investment (*INV*) is found to be insignificant in short run. Furthermore, CointEq(-1) is the error correction term (*ECT*) in the regression. Generally, it is used for detecting the long run co-integration. When the Error Correction Term (ECT) is significant and having a negative sign, we reject the null hypothesis of no long run relationship. The short run effects of independent variables are converging to achieve long run equilibrium with a yearly speed of 0.97 or in other words the short run effects are corrected with a convergence speed of 97 percent yearly for attaining the long run equilibrium level. The long-run results of Auto-Regressive distributive Lag (ARDL) are presented in Table 9.

TABLE 9: LONG RUN CO-INTEGRATION

Variable	Coefficient	Std. Error	Prob.
ML	0.22***	0.05	0.00
NC	0.08***	0.02	0.00
VAT	0.93*	0.55	0.11
INV	-0.24***	0.06	0.00
EMP	-0.42**	0.16	0.01
C	12.61	15.06	0.41

***, ** and * stands for 1%, 5% and 10% level of significance respectively.

We find that money laundering (*ML*), national consumption (*NC*) and investment (*INV*) affect the consumer price index (*CPI*) measuring the inflation in 2005 fixed US dollars statistically significantly at 1 percent. Employment rate (*EMP*) is significant at 5 percent level and value-added tax (*VAT*) is significant at 15 percent. All the expected signs of variables are in accordance with the economic theory. The estimated parameters can be interpreted that when there is an increase of 1 percent in the amount of

money laundering (*ML*), national consumption (*NC*) and value-added Tax (*VAT*), it increases the inflation in economy by approximately 22, 8 and 93 percent respectively in long run. On the other hand, when there is a 1 percent increase in the Investment or capital accumulation (*INV*) and Employment rate (*EMP*) it decreases the inflation in economy by 24 and 42 percent respectively.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This study aimed to estimate the extents of money laundering from 1961 to 2014 and to investigate the impacts of Money Laundering on inflation rate of Pakistan. The amount of money laundering is estimated as a share of gross domestic product (*GDP*) for the period under consideration. It was estimated that money laundering (*ML*) accounted for 20 percent of total gross domestic product (*GDP*) in year 2014 in Pakistan, as well as the series showed fluctuations in different regimes. Further, we examined the impact of money laundering on inflation rate in Pakistan. Augmented Dickey Fuller (*ADF*) was used for testing the stationarity in the series. ADF test revealed that value added Tax (*VAT*) and Employment rate (*EMP*) variables were integrated of order zero *I (0)* while the rest of the variables were integrated of order one *I (1)*. Using Pesaran *et al.* (2001), having a combination of *I (0) and I (1)*, warranted to use Auto Regressive Distributive Lag (*ARDL*) model. Furthermore, ARDL Bounds test for testing the long-run co-integration was used and the model checked for autocorrelation and heteroscedasticity. It was found that money laundering (*ML*) was positively and significantly affecting the Inflation rate (*CPI*) both in the short and long run. In long run, for everyone 1% increase in the money laundering resulted an increase of 22% in inflation annually. Due to non-availability of the money laundering data, we estimated it based on certain assumptions and it is only true when those are fulfilled. Furthermore, this study reveals that money laundering once becomes a part of the economy can lead to inflation. Therefore, due to its illicit use and then its effect on inflation strongly demands strict action on the part of policy makers for stringent measures and enforcement.

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