



## **Social and Macroeconomic Uncertainty and Private Savings: A Case Study of a Developing Economy**

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### **ABSTRACT**

We examine the effects of various new variables relating to uncertainty and find that “social uncertainty” in the form of increased crime is leading to portfolio substitution from bank accounts towards savings in durable goods and other real assets in a typical low middle income economy of Pakistan. Accounting for the cultural phenomena of savings in gold and non-bank real assets in South Asia, we have modeled macroeconomic uncertainty through both the levels and the volatilities of gold prices and the stock market index, as well as income volatility. We find that higher social and macroeconomic uncertainty leads to larger precautionary savings in non-bank assets and thereby results in lower residual savings in the National Income Accounts; this result is robust and invariant to various measures of uncertainty. We also find support for the permanent income life cycle hypothesis and “weak form” evidence for Ricardian equivalence.

**Keywords:** Private Savings, Uncertainty, Consumer Durables

**JEL Classifications:** D81, E21, E62

### **1. INTRODUCTION**

Low savings rates in developing countries such as Pakistan create continued reliance on foreign private savings and Official Development Assistance from G-20 countries from their government savings. In addition regular resort to International Monetary Fund bailouts becomes necessary for financing persistent current account deficits. The other effects of low savings are witnessed through lower growth rates, depreciating currency values, growing external debt and insufficient funds for debt servicing. Understanding the determinants of savings is thus the key to understanding a host of chronic macroeconomic ailments in both South Asian and other low and middle income economies<sup>1</sup>.

A number of previous studies on savings behavior in South Asia have tested for the determinants of savings with varying results (Agarwal et al., 2009b; Loayza and Shankar, 2000). Largely, the

concern of these studies has been with testing for verification of either the Absolute Income or the permanent income life cycle (PILC) hypothesis. However, the empirical literature is generally scant on measuring the effects of uncertainty on private savings. The paper attempts to fill this void in the literature on low savings rates in South Asia by augmenting the traditional savings’ determinants with new uncertainty related variables.

Noting the visible and deteriorating law and order situation witnessed since the last two decades we introduced incidents of crime as a proxy for the uncertainty affecting the saving and investment decisions of households. The spate of terrorism incidents and bank robberies as well as gun point thefts at automatic teller machines (ATMs) has created safety issues for bank customers. It is hypothesized that they have reduced their bank visits and are instead keeping larger cash balances at home or in other non-bank saving instruments. This security issue is more pronounced and especially valid in large urban and commercial centers, though with a lesser degree of severity in smaller rural towns. The effects on savings of this “social

<sup>1</sup> Siddiqui (2007) lists some key stylized facts of South Asian economies relating to twin deficits and debt.

uncertainty” as we dub it have not been examined before. Earlier studies have however tested for the effects of “macroeconomic uncertainty” on saving and consumption by using inflation as a proxy variable (Athukorala and Sen, 2004; Agarwal et al., 2009b). However, we have tested for macroeconomic uncertainty with new variables that reflect saving decisions in consumer durables and other financial assets such as stock market investments also refereed in the literature as portfolio investments. To capture these effects we have utilized the Karachi Stock Market Index and the price of gold as determinants of private savings. To the best of our knowledge these variables too have not been used in earlier econometric estimates of savings. In addition we also model macroeconomic uncertainty by directly testing for the effects of income volatility over and above the level of income which is a traditional PILC determinant of savings. Similarly we examine the effects of the volatilities of stock market index and the price of gold on private savings.

The rationale for using the price of gold and stock market index as determinants of savings is that traditionally a vast majority of South Asian households save a part of their disposable income in consumer durables, especially gold and also in other real assets. In the credit constrained regions of South and East Asia and due to relative lack of substitute saving instruments, which are more readily available in money and capital markets of developed economies, savings in real assets act as a hedge against inflation. Moreover, the “liquidity” and “store of value” properties of gold make it an ideal saving instrument for purposes of children’s marriages, their education, home or cattle purchases, and to tide over other income related uncertainties including job and income loss. Savings in gold are largely used for precautionary purposes; hence the inclusion of the price of gold as a regressor essentially captures the precautionary saving behavior in the South Asian context.

Pakistan is an appropriate and representative country to examine the private saving behavior in lower income developing countries as it shares with them some common income inequality and development characteristics. Second, like its other South Asian neighbors’ Pakistan too has undergone significant policy transitions in the financial and asset markets and in trade liberalization, thus it is an appropriate and representative country for studying historical saving behavior. Finally, despite financial sector reforms initiated in 1989, and which continued through the 2000s with privatization of the banking sector, the positive effects on saving behavior have yet to be seen, and low saving rates remain an enigma for policy makers.

This paper is divided into five sections. Section 1 has introduced the relevance of re-examining the saving behavior by using some new social and macroeconomic uncertainty related variables. Section 2 presents savings trends. Section 3 provides a selective review of theoretical and empirical literature on determinants of savings. Section 4 presents the parsimonious model of savings estimated by us. Section 5 presents the estimation methodology of autoregressive distributed lag (ARDL) co-integration technique and Ng–Perron unit root tests. Section 6 estimates the model and Section 7 concludes.

## 2. SAVINGS TRENDS

Private saving rates have been low in South Asia and in Pakistan. Chart 1 shows that the ratio of private savings to real gross domestic product (GDP) has averaged 9.2% in the last 5 years, a decline of 5.7% from the decade of 2000s. It brings memories of the 70s when private saving rates were low and between 5% and 10% of real GDP. The incidence of low private saving ratios is corroborated by gross savings defined as the gross national income minus consumption plus transfers. Pakistan’s gross savings ratios averaged 23% in the 2000s and in the period 2011-14 these have declined to 21.3% as compared to its neighbors India (32%) and Bangladesh (38.5%). Not surprisingly these low savings are then reflected in low investment-GDP ratios. In 2014, Pakistan’s investment-GDP ratio is the lowest in the region at 13.9% compared to its poorest neighbor Nepal at 28.8% and India at 32%. The persistently low saving ratios are also typically associated with chronic current account deficits reflected in net inflows of positive foreign savings. The average current account deficits were 4.9% in the 70s, 2.6% in the 80s and 3.6% in the 90s. However, the deficit has decreased to an average of 2% over 2010-14.

## 3. DETERMINANTS OF SAVINGS

The literature on private savings has outlined some commonly accepted determinants of private savings largely based on the PILC hypothesis and Ricardian theory as well as open economy effects on savings. Typically these relate to government policy, demography, financial variables, measures of uncertainty and open economy effects. For a comprehensive survey (Grigoli et al., 2014).

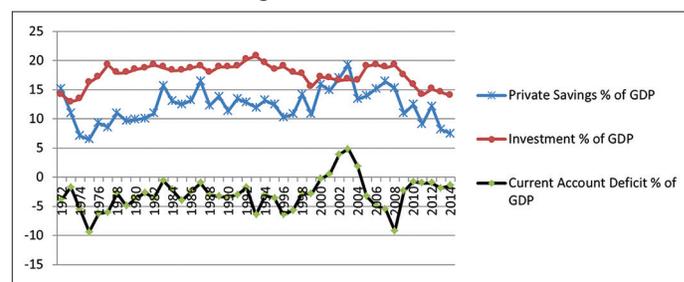
Below we first discuss the traditional PILC determinants of savings in section 3.1 and then in section 3.2 we present the rationale and justification for the “social uncertainty” and “macroeconomic uncertainty” measures proposed in this study.

### 3.1. PILC Model

#### 3.1.1. Income

Income has been a primary determinant of consumption and hence savings. Under the Keynesian absolute income hypothesis, it is absolute current disposable income that matters while Friedman (1956) contends that it is not only current but all expected future income (permanent income) that affects consumption and saving decisions. Modigliani and Brumberg’s (1954) life cycle hypothesis

Chart 1: Private savings, investment and current account deficits



Source: Authors’ chart based on data from State Bank of Pakistan

relates permanent income to the phase of the life cycle of an income earner with highest incomes in working years and low or no incomes in early and retirement years. Whether income is an exogenous determinant of saving or is saving the engine through which investment and income is realized, is a debatable issue. All growth theorists including Romer (1986) and Lucas (1988) subscribe to the latter while Modigliani (1970) and Deaton and Paxon (1994) contend that income growth determines the saving rates.

### 3.1.2. Real interest rate (RIR)

The effects of interest rates on private savings are ambiguous due to income and substitution effects of the price (RIR) change which pull savings in opposite directions. Higher interest rates increase the opportunity cost of current consumption and lead customers to save for enhancing future consumption – the substitution effect. However, higher interest rates also increase interest income and encourage higher current consumption and lower savings – the income effect. Higher interest rates would only increase savings if the substitution effect outweighs the income effect. McKinnon (1974) and Shaw (1973) contend that this is likely to be the case in developing countries where the majority of households are still liquidity constrained and thus are not able to invest in capital market saving instruments. As they keep most of their savings in cash and savings accounts the substitution effect of higher interest rates would be more than the income effect. For a panel of South Asian countries mixed results with small coefficients on RIR were found by Agarwal et al. (2009b). However, Sahoo and Dash (2013) found positive results in the pre and post liberalization periods for a panel of South Asian countries.

### 3.1.3. Public savings

The effects of public savings on private savings have been the subject of much research in the hands of new classical economists utilizing rational expectations models based on Barro's (1974) seminal work that questioned whether deficit financing through bonds constituted net wealth. Ricardian equivalence is the idea that rational individuals factor in the government budget constraint in their savings decisions and irrespective of how the government finances its spending, whether through higher taxes or issuing government debt (equivalence), households concerned with intertemporal utility maximization would try and protect their next generation from the burden of expected future taxes by saving now and leaving them matching compensating bequests. In other words the government's efforts to increase aggregate demand either through expansionary fiscal or monetary policy would not succeed as offsetting savings decisions by households and hence declining consumption would leave total aggregate demand unchanged.

Empirical literature has not been able to find evidence for “strong form” of the Ricardian equivalence rather only for “weak form” as the offset coefficient on the explanatory variable of public savings in the private savings regression model has been much <1 showing a partial crowding out of private savings. The implication is that national savings can only increase with government savings (Dayal-Gulati and Thimann, 1997; López et al., 2000). In a sample of 13 developing countries Corbo and Schmidt-Hebbel (1991) find

that public savings lead to a 47-50% decrease in private savings. Similarly, Masson et al. (1995) also find an offset coefficient of 0.4-0.53 for 21 industrial countries.

### 3.1.4. Age dependency

Modigliani and Brumberg's (1954) life cycle hypothesis accords a central role for age related demographic variables and dependency ratio is one such variable. A higher dependent population increases dis-saving, hence the higher the dependency ratio the lower would be the private saving rates. The issue of dependency is particularly more important in LDCs due to joint family systems. Using a panel of 149 countries Li et al. (2007) analyzed the effects on private savings through both longevity of age and dependency rates and found a positive effect of longevity and a negative effect of dependency rates on savings. In studies on individual South Asian countries Athukorala and Sen (2004) found negative effects on savings of increases in dependency ratios in India and Baharumshah et al. (2003) found inconclusive long-run results for Pakistan. Agarwal and Sahoo (2009a) found that savings were negatively affected by dependency ratios in Bangladesh.

## 3.2. Effects of Uncertainty on Savings Behavior

### 3.2.1. Risk aversion and saving

All types of uncertainty eventually impacts permanent income and hence impacts savings and investment decisions. The permanent income hypothesis states that individuals would only increase consumption if their permanent income increases. Any transitory increases in income will not be consumed rather saved to build a buffer stock for future consumption opportunities. In the liquidity constrained economies the inability of the poor to borrow is likely to reduce saving rates (Deaton, 1991). However, given this fact, the other side of the coin is that the poor may be more risk averse in light of limited borrowing and asset diversification options and hence they perceive higher future uncertainty of incomes, which could make them save more.

To empirically test for the effects of uncertainty on savings, the literature has modeled income uncertainty through inflation. It is believed that a rise in current inflation is perceived by economic agents as an increase in future inflation and which is then associated with higher expectations of future income uncertainty. The net effect of inflation on savings is ambiguous due to two opposing effects i.e., the positive effects on precautionary savings due to uncertainty and the negative effects on savings due to erosion of real after tax disposable income. In our paper we have not included inflation as an additional regressor as it was causing multicollinearity issues with RIRs. The RIR captures some of the uncertainty affecting wealth and hence such uncertainty also affects the consumption and saving decisions. However, this is an indirect way of testing for effects of income volatility on savings. To circumvent this shortcoming we have explicitly tested for income related macroeconomic uncertainty by directly including income volatility as an additional determinant of private savings.

### 3.2.2. Social uncertainty and savings

“Social uncertainty” has significantly increased in Pakistan due to its peculiar geo-political location and governance issues. This uncertainty is manifested in recurring episodes of bomb blasts,

robberies and thefts and holdups at banks of customers shopping for banking services. This has resulted in a deteriorating law and order situation which has been building up since the 1990s and which has further worsened as seen from an escalation in incidents of terrorism and an increase in the crime rate in the 2000s. It needs mention that this terrorism is not by any means unique to Pakistan but has become a recurring phenomenon in some Middle Eastern and African countries; therefore the economic implications of this study are not regionally limited.

As social uncertainty is not directly observable we have used one new representative variable to reflect this phenomenon and these are the First Information Reports (FIRs) of crimes lodged with the police. Due to increasing incidents of individuals being robbed at ATMs or when coming out of banks with money or on streets in general, there has been a growing tendency to avoid keeping savings in financial institutions. Therefore, rising social uncertainty could be one of the reasons for lenders to avoid keeping their savings in financial institutions and this type of uncertainty can result in declining bank savings. However, it can be argued that while bank savings may decline due to a persistent law and order situation, the total savings need not decline as savers would substitute other forms of savings for bank savings. For example, people could keep money under the mattress in a non interest earning liquid asset form or in some consumer durables e.g., gold or they could purchase ownership shares in business companies through stock markets. We conclude that social uncertainty as seen through higher crime rates would likely cause asset substitution but not reduce total private savings. However, if social uncertainty or macroeconomic uncertainty is causing people to move their savings towards consumer durables then measured savings of National Income Accounts (NIA) which are a residual of income less spending would decline. Thus by this logic the coefficient on crime rates in the savings equation is expected to be negative. Below we describe in more detail the income and substitution effects of uncertainty on savings in “consumer durables.”

### 3.2.3. *Macroeconomic uncertainty and savings in assets*

Theoretically, uncertainty affects savings and consumption because it makes future employment and incomes uncertain. The empirical literature has modeled such uncertainty by using inflation and unemployment rates as determinants of saving amongst other PILC variables. Data on Pakistan’s unemployment rates is of poor quality and unreliable as official statistics significantly underestimate the large urban and rural unemployment so commonly witnessed. Disguised unemployment is another factor masking the true unemployment rate. Consequently, in this study we have not used either unemployment rates or labor force participation rates as determinants of savings<sup>2</sup>. Instead we have modeled macroeconomic uncertainty through two indicators of uncertainty: Price of gold and the stock market index.

In the South Asian context there are cogent reasons for modeling saving decisions on consumer durables especially gold acquisitions by households. Loayza and Shankar (2000) and Jalava and

Kavonius (2007) have suggested that estimates of savings in India and Organization for Economic Co-operation and Development countries increase when expenditures on consumer durables are treated as investment. Gold has traditionally been a saving instrument in India and other South Asian countries for centuries. Data from various publications of the World Gold Council shows that in 2014 India again climbed to be the world’s largest gold consumer on the back of a surge in jewelry demand. The usage of gold in India peaks during the religious festival of Diwali (for offerings to deities and in temples) and the wedding season. In Pakistan, a Muslim country, the demand for gold largely peaks during purchases of dowries for weddings. The demand for gold is assumed to be relatively price inelastic in South Asia. The reason for this inelasticity is that gold is an essential item in weddings and it has hardly any consensus substitutes for the purposes that it is being used for. A related reason for why households save in gold is that it has been a long standing and traditional form of saving, serving the store of value function of money. It is also a liquid asset due to its quick convertibility with low transaction costs of conversion and it has been perceived to increase in long-term inflation-adjusted value and believed by savers to be offering a higher long-term net return than bank deposits.

Domestic gold prices at any time reflect both the stable domestic demand and also the change in international gold price which increases with global macroeconomic uncertainty. Rising gold prices are an indicator of current and future uncertainty; as a consequence of which, risk averse households are likely to save more for the rainy day due to precautionary reasons. But if we assume that the demand for gold is inelastic, then with rising gold prices, consumer expenditures on gold would still rise, despite some fall in quantity demanded along an inelastic demand curve for gold. Hence, savings as traditionally measured i.e., income less consumption would reduce - this is the “substitution” effect of higher gold prices on private savings (in non-gold savings). But the increase in price of gold can also have a positive wealth effect on consumption of both non-durables and durables thereby reducing traditionally measured savings<sup>3</sup>.

However if the demand for gold is elastic, higher gold prices would reduce the demand for gold, reducing the savings in gold and increasing the financial savings. In the elastic demand case the income effect of higher gold prices increases the wealth and hence the consumption of durables and non-durables alike and thereby reduces the residual savings of NIA. We conclude that in the case the demand for gold is elastic; the substitution effect of higher gold prices increases traditionally measured savings while the income effect reduces savings and the overall effect is ambiguous. It is an empirical question whether the aggregate demand for gold is elastic or inelastic. However, it is highly likely that due to cultural and other reasons mentioned above the demand for gold is relatively inelastic not only in Pakistan but all over South Asia. Assuming an inelastic demand curve for gold we expect the

2 Adjusting for the underground economy resulted in approximately 9% increase in disposable income in New Zealand with almost doubling of savings rate (Claus and Scobie, 2002).

3 Unlike the wealth effect of higher interest rates where net lenders derive income flows from lending their existing financial asset of liquid money through financial intermediaries, the cash flow gains from the wealth effect of higher gold prices and its consequent effect on consumption and savings can only be realized after asset sales of gold.

combined (negative) substitution and wealth effects to outweigh the positive precautionary savings effect and we hypothesize a net negative impact of higher gold prices on private savings. The reason is that those households that barely survive at subsistence levels of consumption and poverty may find it impossible to save for precautionary reasons for the future, however uncertain it may be (Modigliani, 1993).

### 3.2.4. Savings and capital markets

Capital markets afford lenders another instrument for investing private savings. Asset purchases by domestic and foreign buyers as well as any positive news and optimism will push up the index and *viz.* Conversely, an increase in uncertainty would be reflected both in a decrease in market capitalization and a fall in the stock market index. By the precautionary savings hypothesis, a falling stock market index should be associated with rising buffer stocks of precautionary savings in relatively safer assets by rational households. These assets could be either consumer durables such as gold which is considered relatively less risky than stock market investments or it could be the much safer bank deposits but with much lower rates of return.

If macroeconomic uncertainty and the resulting asset substitutions move funds from stock markets only towards consumer durables (gold savings amongst other real assets) then the measured residual savings of NIA would show a proportional reduction. However, if savers are highly risk averse and they do not wish to invest in consumer durables at all then the (residual) savings of NIA would be unaffected. The reason is that financial savings have been simply diverted from the riskier stock market assets and substituted by much safer bank deposits. If we assume the more likely scenario that rational investors would diversify their savings portfolio through a mix of durable goods investments and bank savings, we would see a fall in residual private savings and the coefficient of the stock market index in our private saving model would be negative.

## 4. THE MODEL

Based on the determinants of the PILC model discussed in Section 2, the following parsimonious model was estimated.

$$PS_t = \alpha_1 + \alpha_2 PCI_t + \alpha_3 RIR_t + \alpha_4 DPN_t + \alpha_5 PUBS_t + \alpha_6 FIR_t + \alpha_7 PGOLD_t + \alpha_8 KSI_t + \alpha_9 XVOL_t + \varepsilon_t \quad (1)$$

*PS*: Ratio of private savings to real GDP,  
*PCI*: Log of real income per capita (+),  
*RIR*: Real interest rate (+ or -),  
*DPN*: Dependency ratio - Dependents age <14 and above 65 years as a proportion of working age population of (-),  
*PUBS*: Ratio of public savings to real GDP (-),  
*FIR*: Log of number of first information reports of crimes (-),  
*PGOLD*: Log of price of gold (+ or -),  
*KSI*: Karachi Stock Exchange Index (+ or -),  
*XVOL*: Volatility of PGOLD or KSI or real income estimated from generalized autoregressive conditional heteroscedasticity (GARCH) models (-).

## 4.1. Data

We have used annual data from 1972 to 2014 which largely spans the financial sector reforms period commencing in the 80s and continuing in the 2000s. The source for PS, PUBS, PCI, RIR and KSI is the State Bank of Pakistan. DPN was extracted from the WDI database of the World Bank and FIR and PGOLD were obtained from the Pakistan Bureau of Statistics database.

## 5. ESTIMATION METHODOLOGY

### 5.1. Ng-Perron Unit Root Test

Before we estimate the model it is imperative that we check for stationarity of the dependent and independent variables. As the augmented Dickey-Fuller test has weak power of estimation in small sample sizes we have used the Ng and Perron (2001) unit root test to check the level of integration. This test utilizes detrended time-series generated by generalized least squares (GLS) methodology. This test is most efficient in dealing with power and size distortions in small samples. The equation of this unit root test is as follows:

$$\Delta y_t^d = \varphi + \phi t + \pi y_{t-1}^d + \sum_{j=1}^l \eta_j \Delta y_{t-j}^d + \zeta_t \quad (2)$$

The variable  $y_t^d$  in Equation (2) is first generated through GLS detrending methodology. Equation (2) is estimated with an intercept and a time trend which is to be expected in most economic time series.

Due to the inclusion of  $y_{t-1}^d$  as a regressor and which is also a component of  $\Delta y_t^d$ , the error term generated in any period will be correlated with its previous value (serial correlation). The term  $\sum_{j=1}^l \eta_j \Delta y_{t-j}^d$  is used to avoid the serial correlation problem in Equation (2) after selecting its optimal lag length. The null hypothesis of Equation (2) is  $H_0: \pi = 0$  (unit root problem) and its rejection will ensure the stationarity of any variable of the model. This test uses the modified test statistics  $MZ_\alpha$ ,  $MSB$ ,  $MZ$ , and  $MPT$  given below:

$$MZ_\alpha = \frac{t^{-1} y_t^d - \hat{\sigma}^2}{2t^{-2} \sum_{t=1}^n y_{t-1}^d} \quad (3)$$

$$MSB = \sqrt{t^{-2} \sum_{t=1}^n y_{t-1}^d / \hat{\sigma}^2} \quad (4)$$

$$MZ_t = MZ_\alpha * MSB \quad (5)$$

$$MPT = \left\{ (\bar{c})^2 \sum_{t=1}^n y_{t-1}^d t^{-2} + (1-\bar{c}) t^{-1} (y_t^d)^2 \right\} / f_0 \quad (6)$$

Where,  $\hat{\sigma}^2$  is a variance of the error term  $\zeta_t$  generated by Equation (2). The null hypothesis of non-stationarity is rejected when the calculated values of the four test statistics are less than their critical values at various levels of significance.

### 5.2. ARDL Cointegration Methodology

After confirming an order of integration for the variables of the model given in Equation (1), we utilize the ARDL cointegration

methodology proposed by Pesaran et al. (2001) to verify any long-run relationship in Equation (1). This cointegration test is efficient even in the presence of a mixed order of integration. The ARDL model of our saving function is as follows:

$$\Delta PS_t = v_0 + v_1 PS_{t-1} + v_{2j} X_{jt-1} + \sum_{i=1}^q \delta_i \Delta PS_{t-i} + \sum_{i=0}^p \gamma_{ij} \Delta X_{jt-i} + \xi_t \tag{7}$$

Where,  $PS_t$  is private saving and  $X_{jt}$  comprises the PILC and uncertainty variables of Equation (1). First, the optimal lag lengths of the ARDL model given in Equation (7) are chosen by the Schwartz information criteria. Then Equation (7) is estimated using ARDL cointegration method which gives us estimates of  $v_1$  and  $v_{2j}$ . These estimated coefficients are then used to test the null hypothesis of no cointegration in the saving function given in Equation (7). The null hypothesis is  $H_0: v_1 = v_{2j} = 0$  or  $H_0: \text{No co-integration}$ . This null hypothesis is tested by the bounds testing procedure. If the calculated F value in the bound test is greater than the upper critical bound value it can be inferred that the long-run relationships of model (1) are empirically verified or in other words the model has co-integration between private savings and its determinants.

After establishing the long-run relationships of model (1) we then estimate the short-run association of the variables through the following error correction model (ECM):

$$\Delta PS_t = \sum_{i=1}^l \lambda_{1i} \Delta PS_{t-i} + \sum_{i=0}^m \lambda_{2i} \Delta X_{jt-i} + \gamma \xi_{t-1} + \psi_t \tag{8}$$

A valid short-run relationship requires that the coefficient of  $\xi_{t-1}$  is negative and significant. The negative value signifies that the short-run disequilibrium will converge to its long-run equilibrium.

### 5.3. GARCH Model

To measure “macroeconomic uncertainty” through volatilities of income, price of gold and stock market index given in the variable  $XVOL$  in (1) we have utilized the GARCH model proposed by Bollerslev (1986). The mean equation is given below:

$$X_t = \alpha + \omega_t \tag{9}$$

Where,  $X$  is either income or price of gold or the stock market index in whose volatilities we are interested. Here  $\omega_t$  is the deviation of  $X_t$  from its average value  $\alpha$ .

Further, we utilize the GARCH (1,1) model for the variance equation.

$$\sigma_t^2 = \delta + \phi \omega_{t-1}^2 + \eta \sigma_{t-1}^2 \tag{10}$$

Where,  $\sigma_t^2$  is conditional variance of  $\omega_t$ .  $\phi$  and  $\eta$  are capturing the ARCH and GARCH effects respectively and these should be positive and significant to yield a volatility series. Our estimated GARCH (1,1) model indeed shows that these effects are significant for all of the volatility variables mentioned in Equation (1).

## 6. EMPIRICAL RESULTS

Table 1 shows the results for the Ng and Perron (2001) stationarity test. We find that all variables are non-stationary at levels except public savings. This can be seen from the calculated and insignificant test statistics  $MZ_a$ ,  $MZ_t$ ,  $MSB$  and  $MPT$ . However, stationarity is observed for all variables after first differencing at 5% level of significance. The stationarity of public savings at levels and of other variables at first differences shows a mixed order of integration which makes the ARDL cointegration technique an appropriate method for long-run analysis of our saving model.

### 6.1. Long-run Co-integrated Relationships - The PILC Results

Having established the stationarity of the variables in Equation (1) we now apply the ARDL cointegration models to test the long-run relationships in the saving function. Table 2 shows the results of ARDL cointegration test based on selected lag lengths for the variables specified in Equation (7). We have estimated four models to represent the social and macroeconomic uncertainty in Equation (7). In Model 1 we represent uncertainty through FIR, PGOLD and KSI and this can be referred as our core model. Models 2, 3 and 4 are estimations in which macroeconomic uncertainty is measured through the volatility of the PCI, PGOLD and KSI.

The results show that the calculated F-values are greater than the upper bound critical values in the bound testing procedure. Hence we can reject the null hypothesis of no cointegration and which means that a long-run relationship exists between private savings and its determinants. Further, the results of diagnostic tests are showing the robustness of all models as the F-values of the Jarque-Bera test, Breusch-Pagan-Godfrey test, Breusch-Godfrey test and Ramsey-RESET test are reasonably low and their  $P > 0.1$ . Therefore, we cannot reject the null hypothesis of

**Table 1: Integration analysis (Ng-Perron test)**

Variable	$MZ_a$	$MZ_t$	MSB	MPT
Level of variables				
$PS_t$	-13.0028 (0)	-2.4431	0.1879	7.5944
$PCI_t$	-3.2272 (0)	-1.2558	0.3891	27.9175
$RIR_t$	-12.7809 (0)	-2.5267	0.1977	7.1364
$DPN_t$	-13.5326	-2.5277	0.1868	7.1477
$PUBS_t$	-18.8084** (0)	-3.0511**	0.1622**	4.9393**
$FIR_t$	-7.1667 (0)	-1.8923	0.2641	12.7171
$PGOLD_t$	-3.8806 (0)	-1.3739	0.3541	23.2289
$KSI_t$	-7.2069 (7)	-1.7785	0.2468	12.8299
First difference of variables				
$\Delta PS_t$	-18.8359** (0)	-3.0642**	0.1627**	4.8665**
$\Delta PCI_t$	-20.3751** (0)	-3.1673**	0.1555**	4.6203**
$\Delta RIR_t$	-20.3369** (0)	-3.1837**	0.1566**	4.5116**
$\Delta DPN_t$	-19.8942** (0)	-3.1523**	0.1585	4.5902**
			**	
$\Delta FIR_t$	-19.8214** (0)	-3.1479**	0.1588**	4.5983**
$\Delta PGOLD_t$	-20.2521** (1)	-3.1784**	0.1569**	4.5223**
$\Delta KSI_t$	-20.0917** (6)	-3.1642**	0.1575**	4.5676**

\*and \*\*show stationarity at 10% and 5% level of significance respectively. The optimal lag length is given in brackets. FIR: First Information Report, RIR: Real interest rate

any of these robustness tests and we can conclude that all models are free from the econometric problems of non-normality of error term, serial correlation, heteroscedasticity and any functional form issues.

Table 2 shows the long-run and short-run results of the four ARDL models including their ECMs. In Model 1, the long-run real per capita income has a positive and significant impact on private savings. A 1% change in real income per capita has approximately a 0.008 unit increase in the ratio of private savings to GDP. In linear log models where the dependent variable is linear and the independent variable is in log form, the interpretation of the coefficient is done after dividing the coefficient by 100 or multiplying by 0.01 (Gujarati, 2011). Our results are consistent with findings of the literature which have generally found a positive effect of income on savings rates in developing countries including Pakistan (Corbo and Schmidt-Hebble, 1991). We find that the effect of income remains significant and positive even after including volatility measures in Models 2, 3 and 4.

Similarly, private savings respond positively to real interest rates as seen from a unit increase in interest rates causing a 0.18 unit increase in private savings. This finding substantiates that the substitution effect dominates the income effect, thus validating McKinnon–Shaw hypothesis that repressed interest rates hamper savings and economic growth. A number of previous studies have found either negative or insignificant effects of real interest rates on savings. For Pakistan a positive coefficient on interest rates was found by Vincelette (2006) for the period 1970-2004. Sahoo and Dash (2013) also found a positive association between savings and interest rates in the post financial reform period of 1992-2010. The real interest rate retains its significance in the remaining models.

Dependency ratios have a significant and negative effect on private savings in two of the four models. A unit increase in dependency ratio decreases private savings by approximately 0.28 units approximately in Model 1. The same fact is cited by other studies. Baharumshah et al. (2003) find a similar negative effect in Korea. Agarwal et al. (2009b) also find negative significant effect of dependency ratio in Nepal and Bangladesh. Further, Li et al. (2007) have also found a negative impact of dependency on saving rates in a panel of 149 countries.

We find that the public savings have a less than proportionate effect in crowding out private savings showing weak form evidence for Ricardian equivalence. Specifically a unit increase in public savings is associated with a decline of 0.82-0.61 units in the private savings ratio. This finding is consistent with previous studies for a number of developing countries.

### 6.3. Long-run Co-integrated Relationships - The Uncertainty Results

Social uncertainty as measured by FIRs of crimes has a highly significant and negative effect on private savings in all estimated models. In Model 1, a percentage increase in incidence of crime has a negative effect of 0.0018 units on private saving rates. This

finding provides support for our hypothesis that rising crime rates have negatively impacted savings due to decline in bank visits and hence bank savings. However, we cannot be sure on which assets these savings have been substituted. It is quite possible that some of these savings have ended up in consumer durables or possibly some savings have been parked in non-bank liquid savings. It can be argued that in the presence of internet banking a number of saving and withdrawal transactions can be done from home without any physical visits to the banks and crime rates shouldn't matter in the saving decisions. In the case of a developing region such as South Asia and in Pakistan, internet banking isn't popular or widely prevalent as compared to developed countries. A possible reason is that customers do not trust online banking and its security. Such thinking is explained to a large degree by the low literacy rates in the region.

Our study finds that a 1% increase in gold prices which signifies higher macroeconomic uncertainty has a 0.0005 unit decrease in private saving rates. This provides evidence that savings may be most likely invested in the consumer durable; gold. And those higher gold prices are increasing consumer expenditures on gold due to its inelastic demand. Further, the observed negative effect on residual savings is also likely reflecting a higher expenditure on consumer durables and non-durables due to the wealth effect of rising gold prices.

Lastly we examine the effects of macroeconomic uncertainty through another uncertainty indicator, i.e., the stock market index. To our knowledge this variable has not been explicitly tested as a determinant affecting savings in South Asia or in other literature. A rise in the index reflects a reduction in uncertainty and *viz.* It was found that a unit decrease in the index or rising uncertainty reduces private savings by 0.65 units<sup>4</sup>.

In terms of “macroeconomic uncertainty” being measured by volatilities of income, price of gold and stock market index we find negative and significant impact of all of these volatilities. This unambiguous effect of macroeconomic uncertainty from all three variables provides evidence that precautionary savings are largely being held in non-bank assets and most likely in consumer durables and other assets.

#### 6.2.1. Short-run results

We next evaluate the short-run impact of saving determinants on private savings. In the short-run the estimated coefficient of the error correction term is  $-1.1045$  and it was found to be significant. The magnitude of the estimated coefficient shows a relatively quick adjustment of the estimated short-run savings to their long-term path in 11 months ( $1/1.1045 \times 12$ ). The short-run results on the PILC variables mirror those that were found in the long-run. We found that a percentage increase in real per capita income has a 0.01 unit impact on short-run savings and a unit increase in real interest rate increases savings by 0.15 units. Dependency ratios do not show a short-run significant effect on savings. However, public savings have the expected short-run negative impact on

4 We found similar results when we used market capitalization rates as a proxy for macroeconomic uncertainty. These are not reported and are available from the authors upon request.

**Table 2: Long-run results**

Variables	Model 1	Model 2	Model 3	Model 4
$PCI_t$	0.7986*** (0.0000)	0.6341*** (0.0003)	0.5609*** (0.0010)	0.5846*** (0.0000)
$RIR_t$	0.1755*** (0.0037)	0.2287*** (0.0029)	0.1377** (0.0257)	0.1798*** (0.0019)
$DPN_t$	-0.2777*** (0.0013)	-0.0205 (0.8489)	-0.1026 (0.2912)	-0.3099*** (0.0006)
$PUBS_t$	-0.8193*** (0.0003)	-0.6889*** (0.0011)	-0.6069*** (0.0060)	-0.7044*** (0.0017)
$FIR_t$	-0.1847*** (0.0032)	-0.2107*** (0.0011)	-0.1414* (0.0530)	-0.1911*** (0.0010)
$PGOLD_t$	-0.0538** (0.0365)		-0.0768** (0.0252)	
$KSI_t$	-0.6476*** (0.0004)			-0.7136*** (0.0000)
$PCIVOL_t^5$		-0.9827* (0.0645)		
$PGOLDVOL_t$			-6.1287*** (0.0068)	
$KSIVOL_t$				-3.2598** (0.0203)
Intercept	-2.0853*** (0.0000)	-2.0887*** (0.0012)	-1.2974*** (0.0271)	-1.2279*** (0.0011)
Diagnostics				
F-value (based on Bound test)	3.5512**	4.0807***	4.8882***	5.1048***
Breusch-Godfrey test of serial correlation	1.5227 (0.2345)	1.1147 (0.3404)	0.1454 (0.8653)	1.9385 (0.1628)
Ramsey-RESET test of functional form	1.4085 (0.2490)	0.1535 (0.6977)	0.3799 (0.7065)	1.7169 (0.1553)
Jarque-Bera test of normality	0.2231 (0.8945)	0.0448 (0.9778)	0.1772 (0.9152)	0.6976 (0.7055)
Breusch-Pagan-Godfrey test of heteroscedasticity	0.9122 (0.5270)	1.3002 (0.2800)	1.3093 (0.2731)	1.0334 (0.4405)
CUSUM	Stable	Stable	Stable	Stable
CUSUMQ	Stable	Stable	Stable	Stable
Significance level		Critical F-values		
		Lower bound		Upper bound
1%		2.73		3.90
5%		2.17		3.21

\*\*\*, \*\* and \* are showing significance of coefficients at 1%, 5% and 10% level. P values are in parentheses. CUSUM: Cumulative sum, CUSUMQ: Cumulative sum square, FIR: First Information Report, RIR: Real interest rate

private savings with an estimated coefficient value of -0.80. Thus both in the short- and the long-run we find weak form evidence for Ricardian equivalence (Table 3).

The impact of social uncertainty is negative as hypothesized and we find that a percentage increase in crime rates proxied by FIRs has a negative impact of 0.0017 units on private savings which was similar to the long-run finding. Further we find that social uncertainty has significant negative effects on private savings in 3 of the 4 models thus showing the robustness of estimated results. Macroeconomic uncertainty too has a negative but small short-run effect. A percentage increase in uncertainty as seen from a decline in gold prices is associated with a 0.0007 unit increase in precautionary buffer stocks of savings. In a study of

rural households in Pakistan, Adams (2002) found that due to likely precautionary reasons the marginal propensity to save out of different sources of income in rural households was different as the sources of income were likely to exhibit different degrees of variability and some of these sources of income were related to such assets as cattle. We find that in the short-run the volatility of gold prices is a statistically significant determinant of private savings as seen in Model 3. However, macroeconomic uncertainty measured from both the stock market prices and its volatility is insignificant in the short-run although it is significant in the long-run.

In a survey of some 300 rural households in northern Pakistan, Takashi (2013) found that holdings of livestock are inversely related to shocks to agricultural income through droughts. Further, Rosenzweig (2001) concluded that in low income countries, lack

5 The volatility series of  $PCI$ ,  $PGOLD$  and  $KSI$  were generated from  $GARCH$  (1,1) models for each of these series.

**Table 3: Short-run results**

Variables	Model 1	Model 2	Model 3	Model 4
$\Delta PCI_t$	0.9667*** (0.0001)	0.6794*** (0.0009)	0.6888*** (0.0028)	0.7012*** (0.0008)
$\Delta RIR_t$	0.1450** (0.0167)	0.2175*** (0.0000)	0.1669*** (0.0065)	0.1669*** (0.0023)
$\Delta DPN_t$	-0.3296 (0.2513)	-0.4372 (0.2095)	-1.0219*** (0.0053)	-0.2517 (0.3936)
$\Delta PUBS_t$	-0.8045*** (0.0000)	-0.6411*** (0.0000)	-0.6632*** (0.0000)	-0.7651*** (0.0000)
$\Delta FIR_t$	-0.1668** (0.0421)	-0.2396*** (0.0002)	-0.1220 (0.1478)	-0.1555** (0.0457)
$\Delta PGOLD_t$	-0.0667** (0.0476)		0.0179 (0.6188)	
$\Delta KSI_t$	-0.1978 (0.1536)			-0.2206 (0.1095)
$\Delta PCIVOL_t$		-0.9833*** (0.0005)		
$\Delta PGOLDVOL_t$			-2.0669* (0.0922)	
$\Delta KSIVOL_t$				-1.7414 (0.1782)
$ECM_{t-1}$	-1.1045*** (0.0000)	-0.4839*** (0.0020)	-0.9889*** (0.0000)	-1.1416*** (0.0000)

\*\*\*, \*\* and \* are showing significance of coefficients at 1%, 5% and 10% level. P values are in parentheses. ECM: Error correction model, FIR: First Information Report, RIR: Real interest rate

of insurance and asset markets had resulted in savings in various assets. The findings of this literature provide support that savings are being largely channeled through consumer durables and non-bank assets as was the implication of our results.

## 7. CONCLUSION

This paper investigated the effects of various PILC and uncertainty related variables on private savings in a typical lower middle income developing economy of Pakistan. We augmented the traditional PILC model by empirically estimating for the first time the effects of “social uncertainty” as measured through higher crime rates, and which have significantly increased in the last two decades. Social uncertainty was found to negatively affect savings due to likely asset substitutions from official banking channels towards savings in durables and other assets. We then modeled the effects of “macroeconomic uncertainty” on savings by introducing two new variables i.e., price of gold and the stock market index. We found that given the assumption of the demand for gold being inelastic the increase in price of gold increases expenditures on gold and thus negatively affects the residual savings of the NIA. Similarly, the declines in the stock market index were found to adversely affect private savings. The same results were found when we measured uncertainty through the volatilities of income, price of gold and the stock market index.

The significance of the uncertainty variables both in their levels and in their volatilities is evidence that despite the poverty of the South Asian region risk averse individuals increase their precautionary savings. Based on traditional saving practices we have argued that these savings are largely held in consumer durables and other real assets, thus resulting in a decline in traditionally measured savings of NIA. Finally, the PILC variables of income, interest rates and

dependency ratios were found to be significant with the correct signs albeit with weak evidence for Ricardian equivalence.

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