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ENTERPRISE CREDIT, HOUSEHOLD CREDIT AND INVESTMENT IN PAKISTAN: EVIDENCE FROM ARDL BOUNDS TESTING, 1985–2021

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ABSTRACT

Objective: The aim of the study is to analyze the effect of composition of bank credit on investment in Pakistan. It seeks to evaluate the impact of aggregate private sector credit, enterprise credit and household credit on investment in the long run and short run and make policy recommendations to facilitate productive credit allocation. **Research Gap**: This research has focused the link between aggregate bank credit and investment, whereas few studies have been conducted on the differential impacts of enterprise and household credit in Pakistan. This study aims to fill this gap by investigating the performance of aggregate credit models versus disaggregated models and understanding the implications for investment of the makeup of bank lending. **Design/Methodology/Approach:** The study uses data for the annual period between 1985 and 2021, and uses the autoregressive distributed lag (ARDL) bounds-testing approach. The two models that are estimated are based on a proxy for investment, real gross fixed capital formation. This is the first that includes private sector credit and the second that separates enterprise and household credit. All of the macroeconomic control variables are included in both models. **Theoretical / Practical Implications of the findings:** The findings are found to be confirming a long run relationship between bank credit and investment. The elasticity of the private sector credit to investment is positive at 0.63. Enterprise credit, on the other hand, has a positive elasticity of 0.63, while household credit shows a negative elasticity of −0.15. Investment is positively impacted by public investment, price level, trade openness and the deposit rate. The estimated relationships are reliable, as indicated by the error-correction and stability tests. The findings indicate that policy measures should encourage productive enterprise lending and should choose specific prudential measures to control household credit. **Originality/Value:** This study makes a contribution to the existing literature as it differentiates between the investment impact of enterprise and household credit in Pakistan. It offers empirical evidence that the composition of credit plays an important role in investment, and policy implications on how to enhance the use of financial resources and ensure sustainable economic growth.

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Introduction

The primary link between financial development and capital accumulation and long-run growth is investment, while banks are the primary source of external finance in most developing economies. Banks serve as financial intermediaries, provide capital formation and economic stability, pool savings, and screen projects and monitor borrowers (Boyd & Prescott, 1986; Chick, 1993; Levine, 1997; Chatzoglou et al., 2010; Challoumis & Eriotis, 2024). In advanced economies, banks are an efficient allocator of resources by mobilizing savings and channeled to productive investment (Jaffee & Levonian, 2001). In developing countries, the importance of their role is likely to be greater due to thin capital markets and the urgency of inclusive growth, financial stability and poverty reduction (Douglas, 2008).

Banks in Pakistan provide credit facilities to firms for fixed and working capital and to households for consumer credit—particularly with the growing expansion in consumer credit. Monetary policy has impact on both uses of credit, the deposit and the lending rate. There are two ways in which bank credit can affect the economy. First, the increase in credit availability eases liquidity constraints and increases current consumption and demand. Second, credit to enterprises helps alleviate borrowing pressures, cover fixed and working capital, and enhance resource allocation, thereby increasing productive capacity. According to Schumpeter (1911/1934), innovation through the use of credit is crucial for firms to achieve innovation and thus for growth and technological change. There remains, however, some controversy about the empirical relationship between credit and growth. Some studies support the idea that enterprise credit stimulates growth (Rajan & Zingales, 1998; Aghion et al., 2005), others that finance is a mere consequence of growth, as demand for credit increases as the economy grows (Robinson, 1952; Lucas, 1988; Favara, 2003). Household credit is even more confusing, in that it is primarily used to finance consumption, hence could reduce saving and contribute to financial fragility, and a number of papers find no relation—nor even a negative relation—between household credit and growth (Beck et al., 2012; Sassi & Gasmi, 2014; Léon, 2016; Majeed et al., 2019).

The case of Pakistan is a good example to learn the importance of bank credit allocation. Total investment has also been kept below 20% of GDP and the IFC and World Bank (2021) estimate that it should be almost doubled to 25-30% of GDP by Pakistan's centenary to reach the upper-middle income level. The ratio of private sector credit to GDP came down to historically low levels after the boom in credit during the FY2005-08, due to government borrowing in the banking system pushing out private sector lending (State Bank of Pakistan, 2015a). The private investment was 8.7% of GDP (ProPakistani, 2024, citing the National Accounts Committee figures) and total investment was at 13.1% of GDP, the lowest since FY1973-74, in the more recent years.

In the earlier studies the credit and investment in Pakistan are dealt with as an aggregate of credit and investment (Khan & Khan, 2007, Salman & Ahmad, 2014). A second literature confirms the different macroeconomic impacts of enterprise and household credit (Beck et al., 2012; Sassi & Gasmi, 2014; Léon, 2016; Goaied & Gasmi, 2021), but it is based on economic growth not on investment and is overwhelmingly based on cross-country panels. The credit and the growth is studied by Majeed et al. (2019) and Majeed and Iftikhar (2020) but not the impact of credit

composition on investment. To the best of our knowledge, this is the first study in Pakistan which investigates the impact of bank credit to enterprises and bank credit to households separately on investment.

We take up three questions. First, does aggregate private sector credit increase investments in Pakistan? Secondly, is there a difference in the effect of enterprise credit and household credit on investment? Third, how do the deposit and lending rates, by which monetary policy affects credit conditions, impact investment? Based on the evidence presented above, we project that enterprise credit will positively impact investment while household credit will have a smaller and perhaps negative impact. The data used are annual for the period 1985–2021, and the ARDL bounds-testing approach of Pesaran et al. (2001), which is suitable for a small sample with series of mixed orders of integration, are used to complement the estimates, and the estimates are complemented by CUSUM stability tests and impulse response functions.

The rest of the paper is organized as follows. Section 2 reviews the literature, Section 3 presents the model, the econometric methodology and the data, Section 4 reports and discusses the results, and Section 5 concludes with policy implications and limitations.

Literature Review

Finance, credit and investment

The relationship between finance, investment and growth has been a pivotal issue for the early development economists. Banks lower the costs of acquiring and processing information about the investments they are considering, and keep track of the companies on behalf of scattered investors (Diamond, 1984). They also convert liquid deposits into longer term loans, provide depositors with safety, liquidity, and payment services, and pay out a smaller return than on loans and securities (Greenspan, 1993; Levine, 1997). The ability of well-developed credit markets to foster growth by facilitating the financing of productive firms finds support in the vast literature on the subject (Rajan & Zingales, 1998; Ndikumana, 2005; Demirgüç-Kunt & Levine, 2008; Sassi, 2014). The opposite opinion is that finance is reactive to growth, that is, when the economy is growing, more credit is sought (Robinson, 1952; Lucas, 1988).Empirical research on finance and investment, broadly speaking, but not always, shows positive effects. Xu (2000) examines 41 countries and concludes that for 27 of them financial development has long run positive impacts on GDP and domestic investment, and for the remaining countries short run negative impacts later become positive. Ciccone and Papaioannou (2008), following Wurgler (2000), find both intersectoral investment and financial development to have a significant positive impact on each other. According to Balcilar et al. (2016), the effects of financial expansion, the fiscal surplus and credit to the private sector are all significant in Turkey's investment. Results from other developing countries are less consistent. In the case of Nigeria, Ojimadu et al. (2014) find bank lending to have a positive, but limited effect on capital formation, while government expenditure has a positive and highly significant impact. In contrast, Zaman and Bhattacharjee (2021) find that in Bangladesh domestic credit to the private sector has a negative association with long-run domestic investment.

Enterprise credit and household credit

Theory suggests that the two categories of credit will have different impacts. Enterprise credit is used to finance fixed and working capital, to alleviate financing constraints that restrict the entry and expansion of firms, (Aghion et al., 2007), and to enable firms to use new technologies. Aghion et al. (2005, 2010) maintain that efficient credit markets facilitate convergence towards the technology frontier and transform enterprise credit into higher investment and growth. Household credit is not clearly defined in theory. It can ease liquidity constraints and ease consumption volatility, but it can also reduce aggregate saving (Jappelli & Pagano, 1994), boost the fragility of the financial system and, if financed through imports, contribute little to productive capacity.

This imbalance is seen across the country. Empirical studies that use data for 45 countries find the positive association between enterprise credit and growth, but households have no significant impact (Beck et al., 2012). However, later studies suggest that household credit may be detrimental: Sassi & Gasmi (2014) for the European Union countries, Majeed et al. (2019) in a panel, and Goaied and Gasmi (2021) who conclude that the effects of household credit are detrimental to growth, irrespective of the level of development, and that the benefits of enterprise credit in developing countries have a one-year lag. For Malaysia, similar findings are reported by Law et al. (2021); and for macroeconomic fluctuations, the matter of sectoral allocation of credit is found to matter by Müller and Verner (2024). Mian et al. (2017) show that higher increases in household debt are correlated with lower GDP growth in the following year and are followed by a consumption boom and a turnaround in the trade balance for 30 countries; and Büyükkarabacak and Krause (2009) demonstrate that credit composition is also important for the trade balance. All studies do not see a positive role for enterprise credit. Léon (2016) does not find evidence of a positive impact of business credit on growth, but a negative impact of household credit, whereas Capolupo (2018) obtains the same results for Italy. Al Rahamneh (2023) does not find any long-run relationship between firm lending and growth in the case of Jordan.

Studies of investment and bank credit in Pakistan mostly use aggregate credit. The econometric model of the role of financial institutions in financing private investment is estimated by Masih (1979) while Qayyum (2002) illustrates that the most important determinants of the private business demand for bank loans are the firms' output and the interest rate on bank credit. The results obtained by Khan and Khan (2007) by performing ARDL on 1972-2005 shows little effect of most traditional determinants on private investment and support for the accelerator and crowding-out hypotheses, but not the McKinnon-Shaw hypothesis. The crowding-in effect of public investment on private investment was highlighted by Salman and Ahmad (2014). Kamal and Hussain (2023) on the other hand, conclude that on the supply side, government borrowing from commercial banks is a substitute for private sector credit and that the quantity of funds is more important than the interest rate for private sector credit. The credit and growth literature of Majeed et al. (2019) and Majeed & Iftikhar (2020) focuses on credit and growth, rather than on investment.

To our knowledge there is no study which differentiates enterprise credit from household credit in explaining investment in Pakistan. This paper fills that gap. It also makes the monetary policy

variables, that is the deposit rate and the lending rate, have a direct impact on investment, following Ndikumana (2016).

Materials and methods

We follow the investment model of Ndikumana (2016) where investment is a function of bank credit, monetary policy indicators and other factors.

$$I_t = \alpha_0 + \alpha_1 X_t + \beta Z_t + \varepsilon_t \qquad (3.1)$$

The investment component (real gross fixed capital formation) is denoted by igt, while the vector of other determinants of investment (trade openness, real GDP, public investment, and the consumer price index in base year of 2015–16) is denoted by X_t and Z_t, respectively. The vector of credit and monetary policy variables includes bank credit (later decomposed into enterprise and household credit) and the deposit and lending rates, which transmit monetary policy to credit conditions; ε_t is a white-noise error term. Model 1 reflects the influence of aggregate private sector credit on investment:

Data Sources

The study is based on annual time series data from 1985 to 2021 (36 observations). The data on private sector credit, credit to enterprises and credit to household sector is drawn from SBP Handbook of Statistics on the Pakistan Economy (2015b) and the International Monetary Fund's (IMF) International Financial Statistics (IFS). Data on real GDP, public investment, the consumer price index and the other macroeconomic variables come from the Pakistan Bureau of Statistics (formerly the Federal Bureau of Statistics) and the Pakistan Economic Survey, and trade openness is taken from the World Bank's World Development Indicators (WDI). The variables measured in monetary units are real in 2015–16 dollars. All series are in natural logs, except for lending rate, which is in percentage points, and for deposit rate and trade openness, which are in percentage points.

Model 1

$$LGFCF_t = \alpha_t + \beta_1 LPSC_t + \beta_2 LRGDP_t + \beta_3 LR_t + \beta_4 DR_t + \beta_5 LCPI_t + \beta_6 TO_t + \beta_7 LPUBI_t + \varepsilon_t$$

(3.2)

The real gross fixed capital formation, which proxies investment in physical capital, is denoted as LGFCF in Model 1, while the log of private sector credit is represented as LPSC; the log of real GDP is represented as LRGDP; the lending rate is represented as LR and the deposit rate is represented as DR; the log of the consumer price index is represented as LCPI, and the proxy for the price level; trade openness is represented as TO and public investment on infrastructure and public projects is represented as LPUBI. Model 2 breaks private sector credit into enterprise and household credit to measure their independent impacts on investment:

Model 2

$$LGFCF_t = \alpha_t + \beta_1 LEC_t + \beta_2 LHC_t + \beta_3 LRGDP_t + \beta_4 LR_t + \beta_5 DR_t + \beta_6 LPUBI_t + \beta_7 TO_t + \beta_8 LCPI_t + \varepsilon_t \quad (3.3)$$

Model 2: LEC is the logarithm of bank credit to enterprises and LHC is the logarithm of bank credit to households. The deposit rate, the lending rate and the control variables (real GDP, the price level, trade openness and public investment) are defined as in Model 1. The coefficient of LEC should be positive and the coefficient of LHC should be zero or negative.

Econometric Methodology

Both models are estimated using the autoregressive distributed lag (ARDL) bounds-testing approach of Pesaran and Shin (1999, 2001), and Pesaran et al. (1995, 1996). There are three benefits of the approach here. It can be applied when regressors are I(0), I(1), or a combination of both, as long as there is no series included that is I(2); has relatively good small sample properties; and with a good lag structure, is able to produce valid estimates in the long run even when some regressors are endogenous. The first test is the bounds test that determines if there is a long-run equilibrium relationship between the variables. If they do, long-run coefficients are estimated, as well as the short-run error-correction model. The Akaike information criterion (AIC) is used to select lag orders. Based on theory, we expect that investment will have long-run relationship with credit of the private sector (Model 1) or enterprise and household credit (Model 2), lending and deposit rates, price level, trade openness, real GDP and public investment. Both models have unrestricted error corrected forms:

$$\begin{aligned}\Delta \log(GFCF)_t = a_o &+ \sum_{i=0}^{n} b_i \Delta \log(PSC)_{t-i} + \sum_{i=0}^{n} c_i \Delta(DR)_{t-i} + \sum_{i=0}^{n} d_i \Delta(LR)_{t-i} \\ &+ \sum_{i=0}^{n} e_i \Delta \log(RGDP)_{t-i} + \sum_{i=0}^{n} f_i \Delta \log(PUBI)_{t-i} + \sum_{i=0}^{n} g_i \Delta \log(CPI)_{t-i} \\ &+ \sum_{i=0}^{n} h_i \Delta(TO)_{t-i} + \sum_{i=1}^{n} i_i \Delta \log(GFCF)_{t-i} + \gamma_1 \log(PSC)_{t-1} + \gamma_2 (DR)_{t-1} \\ &+ \gamma_3 (LR)_{t-1} + \gamma_4 \log(RGDP)_{t-1} + \gamma_5 \log(PUBI)_{t-1} + \gamma_6 \log(CPI)_{t-1} \\ &+ \gamma_7 (TO)_{t-1} + \gamma_8 \log(GFCF)_{t-1} + \varepsilon_t \end{aligned} \quad (3.4)$$

$$\Delta\log(GFCF)_t = a_o + \sum_{i=0}^{k} b_i \Delta \log(EC)_{t-i} + \sum_{i=0}^{k} c_i \Delta\log(HC)_{t-i} + \sum_{i=0}^{k} d_i \Delta(LR)_{t-i} + \sum_{i=0}^{k} e_i \Delta \log(RGDP)_{t-i} + \sum_{i=0}^{k} f_i \Delta \log(PUBI)_{t-i} + \sum_{i=0}^{k} g_i \Delta\log(CPI)_{t-i} + \sum_{i=0}^{k} h_i \Delta \quad (TO)_{t-i} + \sum_{i=0}^{k} i_i \Delta(DR)_{t-i} + \sum_{i=1}^{k} j_i \Delta \log(GFCF)_{t-i} + \gamma_1 \log(EC)_{t-1} + \gamma_2 \log(HC)_{t-1} + \gamma_3 (DR)_{t-1} + \gamma_4 (LR)_{t-1} + \gamma_5 \log(RGDP)_{t-1} + \gamma_6 \log(PUBI)_{t-1} + \gamma_7 \log(CPI)_{t-1} + \gamma_8 (TO)_{t-1} + \gamma_9 \log(GFCF)_{t-1} + \varepsilon_t$$

(3.5)

The bound test is a test of the joint null hypothesis that the coefficients of the lagged levels of the equation are all zero, against the alternative that at least one of them is different from zero: H0 = γ1 = γ2 = ... = γk = 0 (k = 8 in Model 1 and k = 9 in Model 2). The distribution of the test statistic is non-standard and is a function of whether the variables are I(0) or I(1), the number of regressors, and the presence or absence of the intercept and trend. Pesaran et al. (2001) thus present two tables of critical values: one lower bound which assumes all variables are I(0) and one upper bound which assumes all variables are I(1). The null of no cointegration is rejected if the F-statistic is greater than the upper bound, and not rejected if the F-statistic is less than the lower bound; when the F-statistic is between the bounds, the result is inconclusive. The small sample critical values presented by Narayan (2005) are greater than the asymptotic critical values as our sample size is small (n = 36). The long-run coefficients are then estimated, along with the error-correction models in Equations (3.6) and (3.7) which describe the short run dynamics, once cointegration has been determined.

$$\Delta \log(GFCF)_t = a_o + \sum_{i=0}^{n} b_i \Delta \log(PSC)_{t-i} + \sum_{i=0}^{n} c_i \Delta(DR)_{t-i} + \sum_{i=0}^{n} d_i \Delta(LR)_{t-i} + \sum_{i=0}^{n} e_i \Delta \log(RGDP)_{t-i} + \sum_{i=0}^{n} f_i \Delta \log(PUBI)_{t-i} + \sum_{i=0}^{n} g_i \Delta\log(CPI)_{t-i} + \sum_{i=0}^{n} h_i \Delta(TO)_{t-i} + \sum_{i=1}^{n} i_i \Delta\log(GFCF)_{t-i} + \gamma(ECM)_{t-1} + \varepsilon_t$$

(3.6)

The lagged error-correction term with arrow superscripted 1 is ECM_{T-1}, while γ is the speed of adjustment towards long-run equilibrium and should be negative and significant when the variables are co-integrated.

$$\Delta\log(GFCF)_t = a_o + \sum_{i=0}^{k} b_i \Delta \log(EC)_{t-i} + \sum_{i=0}^{k} c_i \Delta\log(HC)_{t-i} + \sum_{i=0}^{k} d_i \Delta(LR)_{t-i} + \sum_{i=0}^{k} e_i \Delta \log(RGDP)_{t-i} + \sum_{i=0}^{k} f_i \Delta \log(PUBI)_{t-i} + \sum_{i=0}^{k} g_i \Delta\log(CPI)_{t-i} + \sum_{i=0}^{k} h_i \Delta(TO)_{t-i} + \sum_{i=0}^{k} i_i \Delta(DR)_{t-i} + \sum_{i=1}^{k} j_i \Delta \log(GFCF)_{t-i} + \gamma(ECM)_{t-1} + \varepsilon_t \quad (3.7)$$

We check the estimated models with the Ramsey RESET test for functional form, the Lagrange multiplier test for serial correlation, a heteroskedasticity test and the Jarque–Bera test for normality of the residuals. The CUSUM and CUSUM of squares tests of Brown et al. (1975) are used to evaluate parameter stability. We first estimate a VAR in the model variables, and calculate impulse response functions from the Cholesky decomposition (Sims, 1980) to track the dynamic responses of investment to shocks. Authors to complete the VAR lag length is (criterion) and Cholesky ordering is (ordering):

Empirical Findings

Descriptive statistics and unit root tests

Descriptive statistics are presented in Table 1. Most of the series are in natural log units, while the deposit rate is in per cent points, and the lending rate and trade openness are in per cent points. The mean lending rate is 11.64% while the mean deposit rate is 4.95%, with a spread of around 6.7 percentage points, and the mean of trade openness is 29.1% of GDP. The mean of the log of real gross fixed capital formation is 9.63 with a standard deviation of 0.66 and the log of private sector credit has a mean of 10.20 with a standard deviation of 0.44. Enterprise credit (mean log 10.07, standard deviation 0.42) is significantly higher than household credit (mean log 8.08, standard deviation 0.59), suggesting a ratio of around seven to one. However, the variable of the two is household credit. The wide range of lending rates (standard deviation is 2.16) and deposit rates (2.05) across the sample corresponds to monetary policy stance changes. In each series there are 36 observations.

Table 1 Summary Statistics of the Variables

	LGFCF	DR	LCPI	LR	LPSC	LPUBI	TO	LRGDP	LEC	LHC
Mean	9.63	4.95	5.05	11.64	10.20	8.19	29.11	11.94	10.07	8.08

Median	9.81	4.91	5.07	11.54	10.19	8.24	29.35	12.00	10.06	8.10
Maximum	10.58	8.80	5.49	15.64	10.86	8.74	34.86	12.63	10.65	9.22
Minimum	8.31	0.95	4.56	7.28	9.09	7.52	20.82	10.89	8.97	6.82
Std. Dev.	0.66	2.05	0.26	2.16	0.44	0.32	2.89	0.52	0.42	0.59
Sum sq. dev	15.35	14.78	2.44	16.35	6.89	3.63	29.30	9.67	6.42	12.22
Observations	36	36	36	36	36	36	36	36	36	36

Source: Author's estimation

The results of the Augmented Dickey–Fuller (ADF) and the Phillips–Perron (PP) unit root tests with an intercept (C) and with an intercept and trend (C&T) are presented in Table 2. The Akaike information criterion is used to select the lag length in the ADF, whereas the Newey–West method is used to select the PP bandwidth. There is mixed evidence. The PP test is unable to reject a unit root for all series except the log of the consumer price index (LCPI), which only rejects the unit root at the 10% level and when an intercept is present. The stationarity of levels is therefore not robust as the ADF test with intercept rejects a unit root at the 10% level for LCPI and household credit (LHC), while the ADF test with intercept and trend rejects a unit root at the 10% level for the lending rate, private sector credit, enterprise credit, household credit and public investment. All series except private sector credit, enterprise credit, and in the specifications with a trend, real GDP and public investment, reject a unit root at the 5% level in at least one of the tests and specifications. There is no series that seems to be integrated more than 1. As the series are I(0) and I(1) variables, but no variable is I(2), the ARDL bounds-testing approach can be used as there is no strict requirement for all variables to be of the same order of integration (Pesaran et al., 2001).

Table 2 Unit Root Test

	ADF test P-value				PP test P-value			
	Level		First difference		Level		First difference	
Variables	C	C&T	C	C&T	C	C&T	C	C&T
LGFCF	0.935	0.527	0.000	0.002	0.935	0.438	0.000	0.002
LR	0.120	0.075	0.002		0.236	0.453	0.002	0.014
DR	0.509	0.565	0.000	0.000	0.469	0.331	0.000	0.000
TO	0.280	0.444	0.000	0.001	0.262	0.560	0.001	0.002
LCPI	0.059	0.219	0.000	0.000	0.052	0.194	0.000	0.000
LHC	0.074	0.080	0.026	0.100	0.158	0.250	0.000	0.000
LEC	0.404	0.081	0.052	0.178	0.952	0.466	0.000	0.004
LPSC	0.275	0.057	0.090	0.041	0.531	0.490	0.056	0.183
LRGDP	0.939	0.167	0.000	0.004	0.352	0.552	0.048	0.164
LPUBI	0.213	0.070	0.000	0.000	0.575	0.450	0.037	0.132

Source: Author's estimation

Bounds test for cointegration

The bounds test is reported in Table 3, which is based on the critical values of Pesaran et al. (2001) for a restricted intercept and no trend. For model 1 (7 regressors), the F-statistic is 6.03 which is higher than the upper bound critical value of the F-statistic at 1% level of significance (4.26), and the null hypothesis is rejected. For Model 2, which uses 8 regressors, the F-statistic is 4.01 which is not rejected at 1% (4.10) but is rejected at 5% (3.39) and 2.5% (3.70). Both models, therefore, suggest a long run relationship between investment and its determinants. The critical values are asymptotic. For small samples, the values of the critical norms are higher, for Model 2 in particular, according to Narayan (2005) with 36 observations.

Table 3 ARDL Bound Test

Critical values of bound test (Restricted intercept and no trend)				
Model 1	Value		I(0) bound	I(1) bound
F-statistic	6.026605	10%	2.03	3.13
		5%	2.32	3.5
		2.50%	2.6	3.84
		1%	2.96	4.26
Model 2				
F-statistic	4.005135	10%	1.95	3.06
		5%	2.22	3.39
		2.50%	2.48	3.7
		1%	2.79	4.1

Source: Author's estimation

Long-run estimates

Table 4 shows the lag order selection based on the ARDL(1, 0, 1, 2, 0, 3, 3, 1) model, which was determined using the AIC criterion for Model 1. Since investment and all regressors are in natural logs, the coefficients of the log variables are elasticities; the coefficients of the deposit rate, lending rate and trade openness are semi-elasticities, which are approximately 100 times the coefficient of the log variable in percent. The deposit rate (DR) is positively associated with the investment with a coefficient of 0.0725, which is significant at 5% level, suggesting that there is an expected relation of about 7% increase in investment with 1% increase in the deposit rate in the long run. This is in line with McKinnon–Shaw theory which states that increases in the return on deposit increase saving, which in turn increases the supply of loanable funds and hence investment (McKinnon 1973; Shaw 1973; Nazir et al., 2013; Chaudhry et al., 2014). The coefficient for the lending rate (LR) is 0.0182 which is significant at the 5% level. This positive sign is opposite to what is usually believed: that higher cost of borrowing results in lower investment (Qayyum, 2002; Jangili & Kumar, 2010) and is also different from the negative sign in Model 2 below. This may be because when lending demand and economic activity are high, lending rates in Pakistan tend to increase, as in the aggregate model

the lending rate is partially a proxy for lending conditions. A sign reversal was observed for the two models, indicating that this result is not robust and should be interpreted with caution.

Table 4 Based on the ARDL model AIC selected the long-run estimated coefficients (1,0,1,2,0,3,3,1)

Model 1

Variables	Coefficient	Std. Error	T-Statistics
LCPI	-0.1385**	0.0543	-2.5506
LPSC	0.6300***	0.1346	4.6805
LPUBI	0.1668**	0.0553	3.0162
LRGDP	1.1854***	0.1042	11.3761
TO	0.0296*	0.0162	1.8271
DR	0.0725**	0.0272	2.6654
LR	0.0182**	0.0081	2.2469
C	-11.2036	1.5182	-7.3795
Diagnostic tests			
R-Square (R^2)	0.997720		
R-Bar Square	0.994788		
F-statistic	340.3133[0.0000]		
W: Functional Form	F (1,13) =0.000824[0.9775]		
X: Serial correlation	F (2,12) =2.133152[0.1612]		
Y: Heteroskedasticity	F (18,14) =0.789916[0.6857]		
Z: Jarque-Bera	0.710186[0.701108]		

Note: W: The Ramsey's RESET test square of the fitted values.

X: The residual serial correlation test using the Lagrange multiplier.
Y: Based on the squared residuals' regression from the squared fitted values.
Z: Based on residual skewness and kurtosis tests predictions

Note|| : The coefficients' significance at 1%, 5%, and 10% are denoted by the symbols ***, **, * respectively

The relationship between private sector credit and investment is positive and very significant in the long-run, with a one-percent rise in private sector credit being linked to a 0.63-percent rise in real gross fixed capital formation (t = 4.68). The elasticity is highest for real GDP, 1.185 (t = 11.38), meaning that an increase in real GDP by 1% will lead to an increase in investment by 1.19%. It aligns with the accelerator principle that increased output leads to increased capital goods demand, which is

derived demand (Fioretti, 2004; Siraj, 2014). The coefficient of public investment is positive and equals 0.167 (t = 3.02) that is consistent with the findings of Blejer and Khan (1984) and Salman and Ahmad (2014) on crowding-in effect of public investment projects in private investment projects. The sign and significance of trade openness is positive and significant at 10% level: a 1 percentage point increase in the ratio of trade-to-gdp corresponds to an increase of approximately 3% in investment. The elasticity of the consumer price index is negative as a result of which for every 1% increase in the price level, investment will decrease by 0.14%. This finding corroborates the work of Madsen (2003), Iqbal and Nawaz (2009) and Olanipekun and Akeju (2013) who indicated that inflation has a negative impact on investment. Since LCPI is the log of the price level, and not the inflation rate, this coefficient represents the impact of an increase in the price level.

Table 5 Based on the ARDL model AIC selected the long-run estimated coefficients (1,0,1,1,2,0,2,1,0)

Model 2

Regressors	Coefficient	Std. Error	T-Statistics
LCPI	-0.1621***	0.0414	-3.9154
LR	-0.0158**	0.0064	-2.4687
DR	0.0452***	0.0161	2.8074
LHC	-0.1539**	0.0643	-2.3934
LEC	0.6261***	0.1425	4.3936
LPUBI	0.1814***	0.0494	3.6720
LRGDP	1.3251***	0.1138	11.6441
TO	0.0355***	0.0092	3.8586
C	-11.4288	1.6912	-6.7578
Diagnostic statistics			
R-Square (R^2)	0.98775		
$\bar{R}^2$	0.98476		
F-statistic	335.5489[0.00]		
W: Functional Form	f(1,16) = 0.5465[0.4551]		
X: Serial correlation	f(1,16) = 1.5574[0.3541]		
Y:Heteroskedasticity	f(16,17) = 0.6853[0.5352]		
Z: Jarque-Bera	1.866645[0.393245]		

Note: W: The Ramsey's RESET test square of the fitted values.
X: The residual serial correlation test using the Lagrange multiplier.
Y: Based on the squared residuals' regression from the squared fitted values.
Z: Based on residual skewness and kurtosis tests predictions
Note$_{II}$: The coefficients' significance at 1%, 5%, and 10% are denoted by the symbols ***, **, * respectively

Table 5 reports the long-run estimates for Model 2, ARDL(1, 0, 1, 1, 2, 0, 2, 1, 0). The signs of all the coefficients are as expected and the majority of these are significant at the 5% or 10% level. There is a strong positive relationship, with enterprise credit explained as a 0.626 percent increase in investment for each one percent increase in enterprise credit in the long run (t = 4.39). This backs up the hypothesis of Majeed et al., 2019; Sassi and Gasmi, 2014 and Masih, 1979 that sufficient financing of the business sector is the mechanism through which financial development leads to increased investment, and the size of the business sector is almost the same as the aggregate credit in Model 1, meaning that the aggregate effect is attributable to financing of enterprises. The coefficient of household credit is negative (−0.154, t = −2.39): the increase in household credit is approximately 1/4 the size of the enterprise credit effect. This is consistent with Beck et al. (2012) and Bahadir and Valev (2020) who have established that lending to households has no significant effect on growth, while lending to enterprises has a stronger impact. It is also consistent with the studies that have shown a negative impact on household credit (Léon, 2016; Goaied & Gasmi, 2021). This finding shows that there is positive correlation between public investment and investment (0.181, t = 3.67), which is consistent with crowding-in (Salman & Ahmad, 2014). The value of the real GDP elasticity (t = 11.64) again confirms the accelerator principle (Fioretti, 2004; Kormishkina et al., 2016). The level of trade openness has a positive and significant impact, the effect of an increase of trade openness by 1 percentage point is approximately 3.6% increase in investment, as greater openness can foster investment either by improving human capital or by increasing the capacity of the economy to finance investment (Kormishkina et al., 2016). The positive impact of the deposit rate (−0.045, or 4.5% per percentage point), while the negative impact of the lending rate (−0.016, or 1.6% lower investment per percentage point) is as expected, which corresponds to the findings of Qayyum (2002) and Jangili and Kumar (2010). The price level has a negative elasticity of −0.162 (t = −3.92).

The lower panels of Tables 5 and 6 report diagnostic tests. The Ramsey RESET test shows that there is no evidence of functional form misspecification in both models (p-values > 0.10), the Lagrange multiplier test indicates that there is no evidence of residual serial correlation in both models (p-values > 0.10), the heteroskedasticity test does not reject constant residual variance in either model (p-values > 0.10), and the Jarque-Bera test does not reject normality of the residuals in either model (p-values > 0.10). The R^2 and adjusted R^2 are high (0.998 and 0.995 in Model 1, 0.988 and 0.985 in Model 2) but a high R^2 for a regression with trending variables is not, in itself, evidence of a well-specified model. On the whole, the diagnostics are not indicative of misspecification but, of course, tests with few degrees of freedom are less powerful.

Short-run dynamics and error correction

The short-run results are given in Table 6, which are the result of reparameterizing of ARDL(1, 0, 1, 2, 0, 3, 3, 1). The error-correction term is −1.29 and highly significant (t = −10.57), which supports the long run relationship of investment and its determinants. Coefficients with an absolute value greater than one indicate that adjustment is overshooting the long run equilibrium; if investment is moving towards the long run path, it does not move monotonically, but instead oscillates around it with diminishing amplitude and then returns to the long run path (Narayan & Smyth, 2006). It is, therefore, very rapid in adjusting and deviations from equilibrium are more than compensated for in

less than a year. The coefficients of the private sector credit are positive and only marginally significant (0.419, t = 1.65), while those of real GDP (1.518, t = 8.71) and the trade openness (0.020, t = 2.76) are positive and significant, and the coefficient of the price level is negative and significant (−0.167, t = −2.59). The short-run impacts of the deposit rate and of past public investment are negative and significant, whereas the long-run impacts are positive. This is perhaps due to adjustment costs, short run crowding out of private investment by increases in public expenditure, and an initial increase in funding costs as the rate of deposits rises, followed by long-term crowding into private investment and the saving-mobilization effects.

Table 6 Short Run Estimated Coefficients Model 1 (1,0,1,2,0,3,3,1)

Regressors	Coefficient	Std. Error	T-Statistic
D(LCPI)	-0.1673	0.0645	-2.5927
D(LPSC)	0.4194	0.2540	1.6510
D(LPUBI)	-0.0686	0.0492	-1.3935
D(LPUBI(-1))	-0.1756	0.0685	-2.5611
D(LRGDP)	1.5184	0.1743	8.7091
D(TO)	0.0202	0.0073	2.7590
D (TO(-1))	-0.0034	0.0078	-0.4404
D (TO(-2))	0.0151	0.0075	2.0103
D(DR)	-0.0341	0.0145	-2.3397
D(DR(-1))	-0.0696	0.0255	-2.7290
D(DR(-2))	-0.0236	0.0137	-1.7188
D(LR)	0.0201	0.0139	1.4377
ECM_{t-1}	-1.2907	0.1221	-10.5703

Source: Author's estimation

Table 7 reports the short-run estimates for Model 2, ARDL(1, 0, 1, 1, 2, 0, 2, 1, 0). Again, the error-correction term is close to −1.14 (t = −7.45) which is significant and larger in absolute value than −1, suggesting that the adjustment is fast with a small overshoot. Household credit has no significant short-run effect: the coefficient on the first lag is +0.098 (t = 1.54) and the contemporaneous coefficient is −0.097 (t = −1.56), which is very close to zero.Enterprise credit has a positive, highly significant short-run effect (coefficient = +0.702, t = 3.94), while there is no significant short-run effect of household credit (first lag coefficient = +0.098, t = +1.54; contemporaneous coefficient = −0.097, t = −1.56). Thus, the negative impact of household credit is only realized after a certain length of time. Real GDP (1.716, t = 5.59) and trade openness (0.030, t = 3.69) are positive and significant, and the price level (−0.187, t = −3.51) is negative. The short-run effect of public investment is negative and significant (both with −0.124 and −0.304) which is again contrary to its long-run sign.

Table 7 Short Run Estimated Coefficients Model 2 (1,0,1,1,2,0,2,1,0)

Regressors	Coefficient	Std. Error	T-Statistic
D(LCPI)	-0.1865	0.0531	-3.5122
D(LR)	0.0085	0.0241	0.3526
D(DR)	-0.0361	0.0254	-1.4212
D(LHC)	-0.0967	0.0620	-1.5596
D(LHC(-1))	0.0984	0.0640	1.5375
D(LEC)	0.7021	0.1784	3.9355
D(LPUBI)	-0.1242	0.0473	-2.625
D(LPUBI(-1))	-0.3041	0.0789	-3.8542
D(LRGDP)	1.7162	0.3071	5.5883
D(TO)	0.0304	0.0082	3.6907
ECM_{t-1}	-1.1412	0.1532	-7.4478

Source: Author's estimation

Stability analysis by CUSUM and CUSUMSQ

We test parameter stability with the CUSUM and CUSUM of squares (CUSUMSQ) tests of Brown et al. (1975), which are based on recursive residuals. If the statistics are not outside of the critical bounds at the 5% level, the null hypothesis that the coefficients are constant is not rejected. Figures 4.1 and 4.2 (Model 1) and Figures 4.3 and 4.4 (Model 2) in Appendix A show that both statistics stay within the bounds, which supports the stability of the estimated coefficients of the error-correction models.

Impulse response analysis

Impulse response functions (IRFs) are derived based on the Cholesky decomposition (Sims, 1980) in a VAR framework, to trace the response of investment to a one-standard-deviation shock to each of the other variables. Responses are in log points (a response of 0.10 corresponds to about a 10% change) since investment is in logs. For the aggregate model (Figure 4.5, Appendix B), the peak of the effect from a deposit rate shock is around 0.13 at period 4, and diminishes by roughly period 12. The effect of an inflation shock is a reduction in investment of approximately 0.085 in period 3 and it fades slowly over time. A private sector credit shock increases investment by approximately 0.067 in period 4, but less in later periods and eventually returns to zero. This phenomenon is what public investments create an initial positive investment shock, which wanes, becomes slightly negative, and returns to the equilibrium level around period 19. The raising of the real GDP shock causes the investment to increase by approximately 0.035–0.04, and the reaction is very persistent, and returns to equilibrium within the horizon. The effect of the lending rate shock (trade openness shock) is small (Figures 4.5(e) and 4.5(g)) and the response to a lending rate shock is initially negative (around -0.03 in period 3) but slightly positive (around 0.015) around period 8, while the response to a trade openness shock is positive, with a small initial negative shock around -0.01, and then a small positive

shock around 0.015. In the disaggregated form (Figure 4.6, Appendix B), a shock to the enterprise credit market has a negative effect on investment during period 5, the magnitude of which is approximately 0.065, but which then fades and returns to the equilibrium level. It is important to note, however, that the opposite shock: a one-standard-deviation shock to a household's credit has the opposite effect, reducing investment by approximately 0.17 around period 4, and fading after about 10 periods. A negative lending rate shock causes an investment decline of approximately 0.06 in period 3 and restores the steady state level of investment. A public investment shock would increase investment by approximately 0.05 in the first few periods, a real GDP shock by approximately 0.04 in period 4, with no return to equilibrium over the horizon (long income cycle), and a trade openness shock by approximately 0.01 in period 6, with the effect declining after about period 14. The responses to deposit rate and price level shocks are similar to those in the aggregate model. In most panels, the 95% confidence bands encompass 0 for much of the horizon and the IRFs therefore should be viewed as suggesting the direction and timing of the short- and medium-run responses, but not as exact estimates. The signs are also generally in line with the long run estimates and with theory: credit to the enterprise sector increases investment; the credit to the household sector decreases it; the rise of output, public investment and deposit rates increases it; the rise of prices decreases it.

Discussion

Three findings stand out. First, it is important to note that there are several compositions of credit. Elasticity of private sector credit raises investment (0.63) but disaggregated model indicates that the positive long-run effect occurs through enterprise credit (0.63) and not household credit (−0.15). It is in line with the Schumpeterian view of credit to productive firms funding innovation and capital accumulation, and with cross-country evidence of enterprise credit having a positive effect on growth but household credit having no effect (Beck et al., 2012; Sassi & Gasmi, 2014; Goaied & Gasmi, 2021). It is also possible that it could help in reconciling the mixed findings for aggregate credit as the negative effect in Bangladesh by Zaman and Bhattacharjee (2021) in this regard. The results do not corroborate the findings of Léon (2016) and Capolupo (2018) on the positive effect of enterprise credit, possibly due to variations in the developing and advanced economy contexts, and between cross-country panels and time series of a single country. Second, the negative long-run effect of household credit is small compared to that of enterprise credit and does not exist in the short run in which the contemporaneous and lagged household credit coefficients are both insignificant and cancel each other. This pattern can be explained in three ways, but is not tested in the study. Household credit primarily funds consumption, which may include imported consumer goods, and therefore could contribute to the increase in import demand, as opposed to productive capacity (Büyükkarabacak & Krause, 2009; Mian et al., 2017). It could reduce the savings of the households and therefore the resources available for investment at home (Jappelli & Pagano, 1994; Léon, 2019).

Each rupee lent to households is not available to firms, however, in a system with limited deposits and high government borrowing, so that a large proportion of banks' assets are used to finance government borrowing (State Bank of Pakistan, 2015a; Kamal & Hussain, 2023). The channels would be expected to grow over time since they operate through saving and imports, and since funds

are allocated to a limited stock, and therefore only expected to have a long-term effect. Third, the tools of monetary policy are used primarily to affect saving and the quantity of credit, not to influence the interest rate. In both models, the effect of a rise in the deposit rate in the long run is positive, in keeping with the McKinnon–Shaw hypothesis that an increase in the return on deposits leads to an increase in saving for investment. In the disaggregated model, in contrast, the lending rate is negative, while in the aggregate model it is positive; and it has a negligible short-run effect in both models, so the evidence of the influence of borrowing costs on investment is weak. The results are contrary to Khan and Khan (2007) who do not find support for the McKinnon–Shaw hypothesis in Pakistan for the period of 1972–2005; however, this may be because of the sample period, the measure of credit and the treatment of credit composition. There are also notes to be made on the results for public investment. In both models, it is seen that the short-run impact is negative while the long-run impact is positive, this is because of the short-run competition for resources followed by the long-run crowding-in as infrastructure raises the returns to private capital (Blejer & Khan, 1984; Salman & Ahmad, 2014). Finally, the error-correction terms are greater in absolute value than one, which means that the adjustment is quick but with overshooting. These values may occur in small samples and for complex dynamics, therefore the short run estimates should be taken with more caution than the long run elasticities.

Conclusions and Policy Implications

In this study, the composition of bank credit was analysed with respect to investment in Pakistan. It estimated one model using aggregate private sector credit and another excluding enterprise credit and including only household credit, which controls for real GDP, public investment, the price level, trade openness and the deposit and lending rate, using annual data for 1985-2021 and the ARDL bounds-testing approach. Both models exhibit LSR relationships between investment. The disaggregated model also finds that the increase in investment from a rise in aggregate private sector credit comes from an increase in enterprise credit, whose long-run elasticity is equal to 0.63, while a rise in household credit is found to have an elasticity of −0.15. Real GDP, public investment, trade openness and the deposit rate are positively related to investment, and the price level is negatively related to it. The error-correction terms, the stability tests and the impulse responses are consistent with these results. The results suggest that not only the size but also the distribution of credit is important for investment. There are four policy implications to these results. Bank credit should be channeled towards the productive sector, especially towards small and medium enterprises and women entrepreneurs, who are the most limited in their access to finance. Credit guarantees, refinancing facilities and risk sharing can help. Second, prudential regulation is needed to limit the growth of household and consumer credit by means of targeted rather than blanket restrictions, including debt-burden and loan-to-value limits. This would prevent the diversion of limited resources from companies and the strain that consumer financing could place on imports and the balance of payments, while still allowing for the extension of credit to consumers for productive purposes. The negative impact of household credit is small compared to the positive impact of enterprise credit and the welfare impact of household credit is not measured in this study. Third, the positive impact of the deposit rate suggests that making deposits more rewarding is important for mobilizing saving. There is mixed evidence about the lending rates, so policymakers should seek to

have predictable and moderate lending rates for productive enterprises, and not just through rate cuts. Fourth, a decrease in government borrowing from the banking system would lead to an increase in availability of money for private lending, which is a supplementary implication from literature and not from our estimates.

Limitations and Directions for Future Research

There are a number of limitations of this study. Sample restrictions (only 1982) and the lack of degrees of freedom in the estimates and diagnostic tests make the ARDL models have a small amount of power and the asymptotic bounds-test critical values may be too lenient in small samples. Future work should make use of currently available private fixed investment data, and investment is proxied by real gross fixed capital formation that includes public investment. The models are not formally tested for structural breaks, such as the 2008 global financial crisis or COVID-19 shock, and they do not distinguish between enterprise credit by size and sector of the bank, or separate consumer, housing and vehicle loans, as structural breaks may have a different impact on these groups. Lastly, the mechanisms proposed (imports, saving and crowding out) were not directly tested. The results could be extended in future studies to other developing economies in Asia such as SAARC, and investigated under non-linear ARDL and break-augmented ARDL framework and disaggregated credit based on borrower and credit purpose.

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Appendix A

Cusum and Cusum square test for Aggregated Analysis

Figure: 4.1 Test for variance stability through CUSUM.

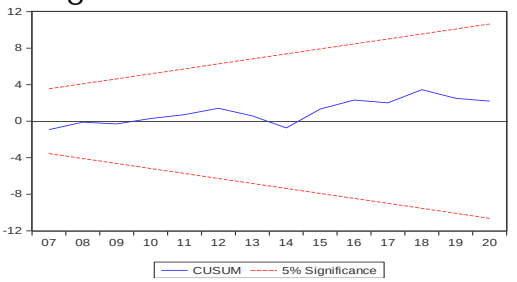
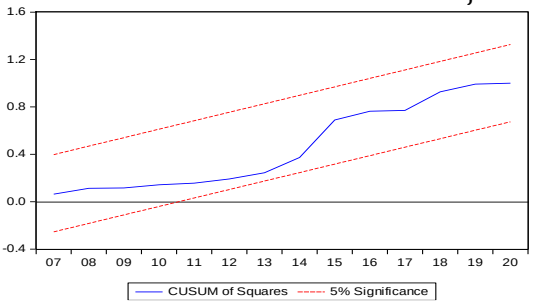


Figure: 4.2 Test for variance stability through CUSUM square.



Note: The crucial boundaries at the 5% level of significance are represented by the straight lines.

Cusum and Cusum square test for Disaggregated Analysis

Figure: 4.3. Test for variance stability through CUSUM.

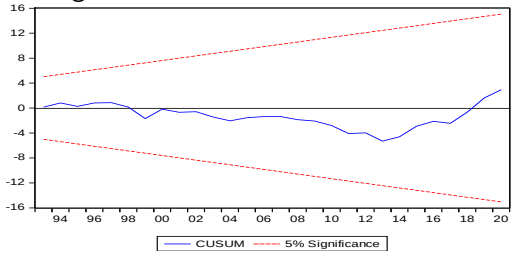
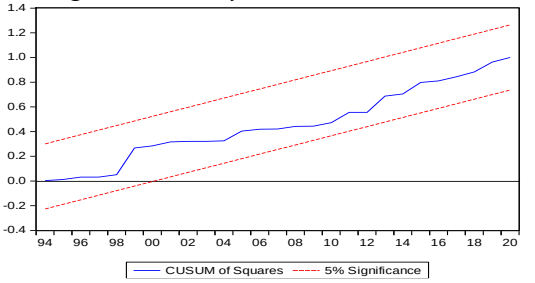


Figure: 4.4 Test for variance stability through CUSUM square

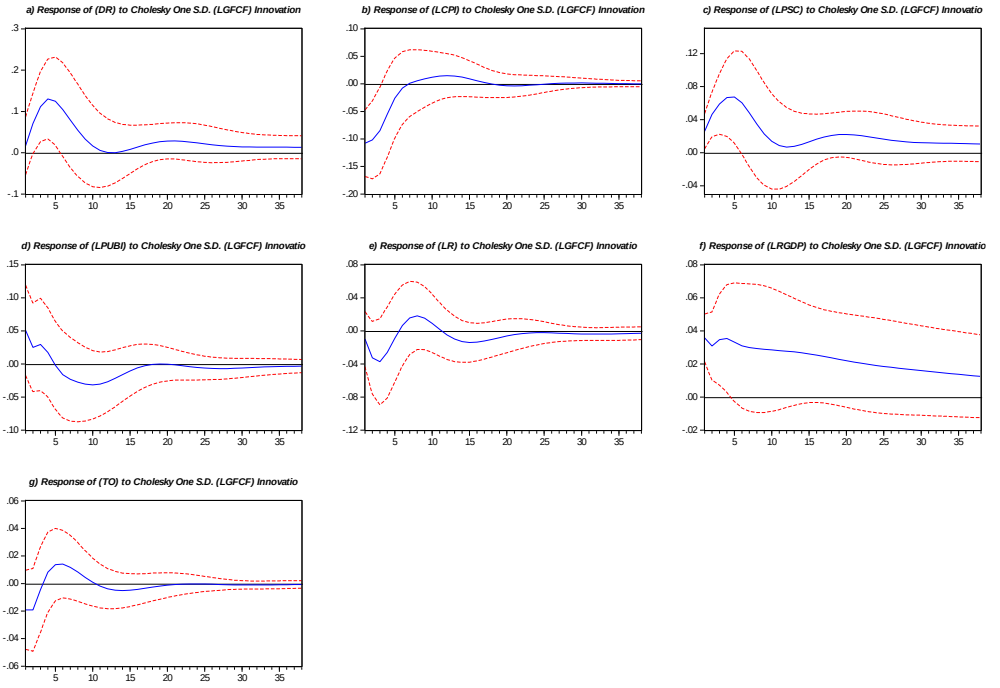


Source: Author's Estimation

Appendix B

Impulse Response Function for Aggregated Analysis

Figure: 4.5 Impulse response function

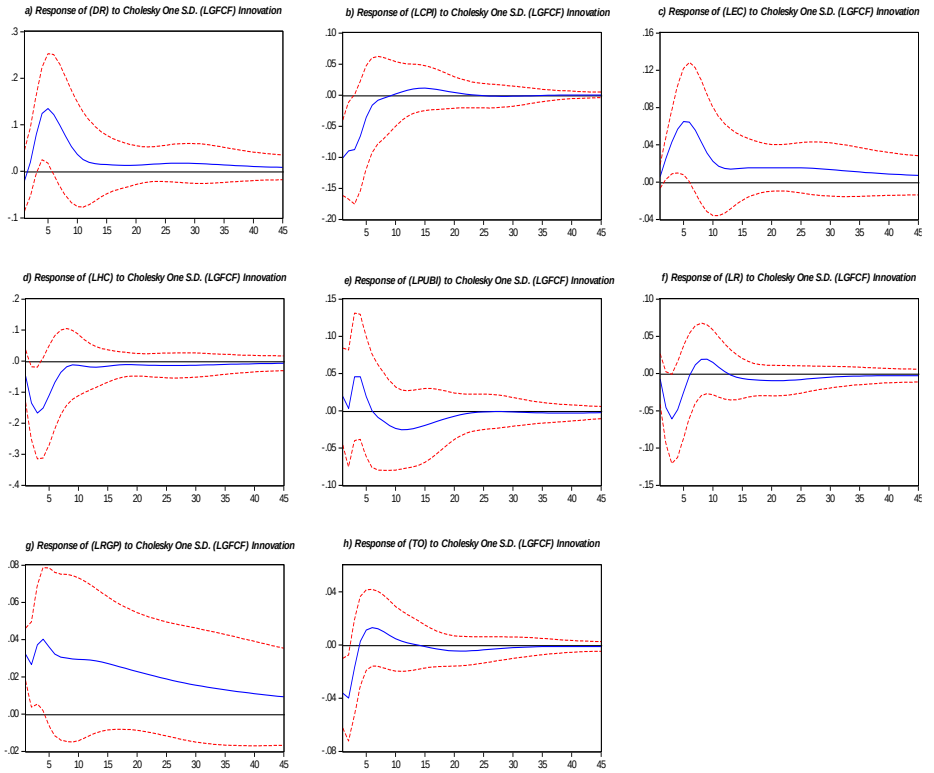


Source:

Author's Estimation

Impulse Response Function for Disaggregated Analysis

Figure: 4.6 Impulse Response Function



Source: Author's Estimation