Motivating Factors of Private Investment in Agriculture Sector of Pakistan

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Abstract

This research study is more helpful and advantageous for less developed and developing counties, whose dominancy more on the agriculture sector. This study has an endeavor to explore the motivated factors of private investment in agriculture sector of Pakistan empirically using time series data for the period of 1980-2014. The Augmented Dicky-Fuller (ADF) unit root test was applied to check the stationarity of variables. The Johansen Co-integration and Vector Error Correction Model (VECM) were used as analytical techniques. The co-integration regression shows the co-integrated factors and long run relation between the private investment and explanatory variables included in the study. The results obtained from the analysis of the Vector Error Correction Model (VECM) indicates that Value-Added in Agriculture Crop Sector (Vagc), Value-Added in Agriculture Sector (Vagri), Credit Available to Agriculture Sector (CAagri), Capital Stock in Agriculture Sector (Kstock), Population Growth Rate (Popg) and Remittances (Rm) have significant and positive while Index of Price of Capital (Ipk) and Weighted Rate of Interest (rw) have significant and negative impact on the Private Investment in Agriculture Sector (Pagri) of Pakistan. The study suggested that government should enhance credit availability and easy method of being paid to farmer for bringing momentum in private investment. Modern technical and access of agricultural products to domestic as well as foreign market will encourage private investment in agriculture sector.

Keywords: Private Investment, Agriculture Sector, Augmented Dicky-Fuller test, Johansen Co-Integration and Vector Error Correction Model.

1.1. Introduction

Agriculture is one of the main and important sector of the economy for all countries and especially for the developing countries. Due to low capital structure, lake of industrial development and heavy machinery developing countries utterly dependent on the agriculture sector. Pakistan too, is a developing country dependent on the agriculture sector and known

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as agriculture country. Though from several decades and increasing problem of the agriculture sector its contribution decreases time to time and stuck to an average of 20% to overall gross domestic product (GDP) of Pakistan. It engages about 45% of the country labor force providing employment opportunities not only helping in reduction in poverty but also in providing food items, improving standard of living especially in rural areas of Pakistan and elevate the economic growth of Pakistan.

The vigorous with dynamic amplification and strengthening growth of agriculture sector persuade the significant contribution to the fulfillment of domestic demand for food, providing raw materials to industrial sector and adding agro-based industry. The agricultural sector has relatively more momentous contribution to the textile manufacturing sector as well increasing the exports to earn lum-sum amount add to the balance of payment of Pakistan particularly from producing cotton. The government of Pakistan launching prototype growth strategy to boost agriculture sector growth by doing different reforms in agriculture sector, providing facilities to the farmers sector, replacing old technical ways with the modern technical and way of farming to enhance the agriculture productivity, improving the quality of the agricultural products enabling to compete with foreign products and in markets, providing agricultural credits to the farmer and encouraging the private sector invest in agriculture sector.

To formulate the agriculture sector of Pakistan assisting effectual and fruitful economic growth and development, fulfill the domestic need and requirements of daily food necessities, became more profitable and injective to the economy, considerable effective in poverty reduction and engaged more labor by providing greater employment opportunities, government of Pakistan and policy makers needs to encourage the private sector for investment to enlarge their role to enhance rapid progress and development of agriculture in Pakistan. For this purpose, the policy framework must be supportive for the private sector investment accompanying with friendly socio, economic and political conditions. The main cause of slow economic growth and limited investment of private sector in agriculture of Pakistan are the traditional technology, low quality and quantity of agriculture products, limited access to domestic and foreign markets, problems of credit availability, unavailability of the skilled and train labor, unavailability new equipments and machinery of agriculture sector as well as limited capacity of resources and infrastructures.

A sufficient literature had been exits on the agriculture sector, done mainly on the typical factors that affect agriculture sector. Looney (1999 & 1995) empirically analyzed the role of capital stock and infrastructure in the agriculture sector of Pakistan. His study concluded that the slow growth of agriculture sector of Pakistan is due to lack of government intrusion towards the policies and reforms of the agriculture sector. Bokhari (1999) identified that the role and contribution of agriculture sector of Pakistan decreases year by year as compared to manufacturing sector. The main reason of this decline that, private sector investment moves from agriculture to manufacturing sector. The ground realities of transform in private investment from agriculture sector due to lack of incentives and encouragement. Looney (1994) addressed that poor performance of the public investment in agriculture sector of Pakistan primarily owing to the ineptitude and vain policies of government towards agriculture sector. Further, the prolong waning rate of agriculture growth due to stumpy productivity and crop production, contemptible funds and credit availability, lack of agriculture financial institutions and services, limited water reservoir's and resources, problem related to land tenure system and unfortunate agriculture products pricing policies. Hyder and Ahmed (2003) pointed out that the core rationale of decline of

private investment in agriculture sector is the dearth of investor confidence, credit availability, incompetent pricing and government policies concerning to agriculture sector.

Enormous and massive investment in agriculture sector is frantically required to assist the busted food requirements in the developing countries. Private investment in agriculture sector preserves an imperative responsibility in achieving the targeted environmental sustainability, economic growth and development as well in reduction in poverty for the less and developing countries. Sahan and Mikhail (2012) addressed that private sector investment in agriculture sector is necessary to subordinate the pressure of the domestic demand occur with climate change, growth in the population, increase demand for daily use items containing food items, meat, milk, wheat , vegetables, energy products etc. however, to amplify and encourage the role of private investment in agriculture sector satisfactorily regulated and back by the government support should glue to basic rules and regulation to gave fruitful outcome.

Naseem and Spielman (2010) analyzed that owed of the introduction of modern technologies in the agriculture sector significantly contributed to the economic growth and reduction of poverty. Some earlier studies done by Alfranca and Huffman (2003), Hazell and Haddad (2001), Anderson and Roseboom (1994) and **Antholt (1994)** found that new technologies agricultural sector drastically contributes in the economic growth and development of the country.

Looney and Winterford (1992) assessed that the focal root of lessening growth of agriculture sector of Pakistanis that, the government of Pakistan adopted market oriented strategy changing from the traditional policy of direct intervention for agriculture products. It is expected from the private sector to contribute more in the agriculture sector providing and arranging more capital, resources and infrastructures from itself. The critical analysis rose by this research study that how private sector can provide and generate capital, resources, modern technology and equipments? The main purpose to conduct this research study is to explore the motivating factors that can significantly contribute to the private investment in agriculture sector of Pakistan. As Pakistan is a developing country having low economic growth, low living of standard confirming by Human Development Index (HDI),that is low for Pakistan, an about sixty percent of the population be falls in poverty line if measured at $ 2/day *(Source: Global Economy Indicator)*. In that situation what will be the factors that contributed to the private investment in agriculture sector of Pakistan despite low saving rate? This is the main concern of this research study.

The objective of this research study is to explore and empirically examine the motivating factors that contributing significantly in private investment in agriculture sector of Pakistan.

2. Description of Data and Model
2.1. Data Analysis

This research study has conducted on annual time series data since quarterly data are not available for some variables from any source in case of Pakistan. The period of analysis if from 1981-2014, prior data year 1981 at a constant price is not available. The data are collected from different sources, keenly observed and the tried to use the most refine data after several steps of analyzing the data. The data for this research study are collected from different sources that are; Agriculture Development Bank of Pakistan (ZTBL), Agriculture Training Institute (ATI) Peshawar, Ministry of Agriculture and livestock, Economic Surveys of Pakistan, Federal Bureau of Statistics (FBS), State Bank of Pakistan (SBP), World Development Indicator (WDI) and Global Economic Indicator.

2.2. Description and Justification of INVESTMENT MODEL

The model used and derived for this research study from the work of White (Sept.1956) that is more or less an extension of Keynes work. Investment can quite comfortably be regarded as the most unpredictable component of aggregate demand. It has long been termed as a major source of growth. Yet no single investment theory explains investment behavior in its entirety. Literature abounds with numerous investment theories that do not show wide differences from each other. As Keynes terms investment as a function of income and interest rate, the accelerator model links investment to the change in output that is a reflection of the change in demand. The marginal cost of funds approach links investment decision with the cost of funds and marginal efficiency of capital. The cost of capital varies with the demand for capital as well as the sources of funds i.e. whether funds are financed through borrowing or from one's own pocket. With an increase in demand for capital the marginal cost of getting funds for additional investment also increases. Quite recently in advance econometric techniques and the availability of latest computing facilities have made it possible to conduct empirical analysis of the investment behavior. This part of the study provides a theoretical framework for investment model.

A natural starting point of discussion of investment is the rationale of the Present Value (PV) criterion and its implication for the determinants of investment. Thus, by reducing current income, the owners can increase future by investing the firms retained earnings. The investment rule, that the firm should maximize its present value by investing in any projects with positive returns. In order to maximize its present value the individuals or firm should invest in all projects that have a (PV>0). The present value ranking depends on the market rate of the interest – the rate at which earning can be reinvested.

Keynes also stressed the importance of expectations in determining investment since it is the expectation that determines the rate of return and thereby any change in expectation would shift the Marginal Efficiency of Investment (MEC). Due to frequent changes in expectation the investment behavior shows wide fluctuations. The Keynesian theory explains investment function with respect to the interest rate. It relates the marginal efficiency of capital (m) with the real rate of interest (r). The marginal efficiency of capital is defined as that rate of discount which equates the present value of net returns to the cost of capital. It declines with an increase in the price of capital and increases with the price of output as well as the quantity of output.

$m = m (Pk, K, PQ, Q)$ 2.1

m = marginal efficiency of capital

Pk = price of capital

K = capital

PQ = price of output

Q = output

The optimal capital stock can be expressed as a function of (r), (Pk), (PQ) and Q

$K* = K (r, Pk, PQ, Q)$ 2.2

Hence   PQ = f (Q)

So the optimal capital stock function equation becomes

$K* = K (r, Pk, f (Q), Q)$ 2.2(a)

Increase in output leads to increase in the level of desired capital stock, hence the partial derivative of (K*) with respect to (Q) shall be positive. However the partial derivative

of (K*) with to the price of output shall be negative. The combined effect of these two variables shall be indeterminate. Hence

$$dK^*/dQ = (\partial k^*/\partial Q) + (\partial K^*/\partial P_k)(\partial P_k/\partial Q) \qquad 2.3$$

$$dK^*/dQ = (\partial k^*/\partial Q) + (\partial K^*/\partial P_k)\; f^{/}(Q) \qquad 2.3(a)$$

This equation can be rewritten as

$$K^* = h\,(r,\,P_k,\,Q) \qquad\qquad 2.3(b)$$

Expressing the function in linear form gives

$$K^* = \alpha_0 + \alpha_1 r_t + \alpha_2 P_{kt} + \alpha_3 Q_t \qquad\qquad 2.3(c)$$

Where, $\alpha_1 < 0, \alpha_2 < 0, \alpha_{3\lessgtr}^{>}0$

Net investment can be written as ;

$$NI_t = (\alpha_1 r_t + \alpha_2 P_{kt} + \alpha_3 Q_t - \alpha_1 r_{t-1} + \alpha_2 P_{kt-1} + \alpha_3 Q_{t-1})\ldots\ldots\ldots\ldots2.4$$

Depreciation is proportional to the capital stock in the previous period

$$D_t = (\delta K_{t-1} = \delta\alpha_0 + \delta\alpha_1 r_{t-1} + \delta\alpha_2 P_{kt-1} + \delta\alpha_3 Q_{t-1})\ldots\ldots\ldots\ldots\ldots2.5$$

Gross investment equals net investment and depreciation therefore

$$I_t = \delta\alpha_0 + \alpha_1 r_t + \alpha_2 P_{kt} - \alpha_1(1-\delta)r_{t-1} - \alpha_2(1-\delta)P_{kt-1} + \alpha_3(Q_t - Q_{t-1})\ldots\ldots2.6$$

$$I_t = (\alpha_0 + \alpha_1 r_t + \beta_1 r_{t-1} + \beta_2 P_{kt-1} + \alpha_3 \Delta Q_t)\ldots\ldots\ldots\ldots\ldots2.7$$

The expected sign of the coefficient are;

$$\alpha_1 < 0, \beta_1 > 0, \beta_2 > 0, \alpha_{3\lessgtr}^{>}0$$

It is an accelerator model as it shows the relationship between the level of net investment and growth rate of output.

2.3. Model for Private Investment in Agriculture Sector

Model for private sector investment in agriculture sector of Pakistan for this research study is derivative of investment accelerator model that is derived and showed in equation (2.7). Investment in agriculture sector includes harvesting and forestry but exclude fishing (now an independent sector, separate from agriculture). This sector now consists of two-sub sectors

    (i)   Agriculture, harvesting and related service activities, and
    (ii)   Forestry, logging and related service activities.

Investment (gross fixed capital formation) in agriculture consists of monetized and non-monetized investment in buildings and structures such as land improvements, improvement of water resources and farm buildings; machinery and equipments such as tractors, threshers, combined harvesters, tube-wells, bullock and camel carts; cultivated assets such as orchard plantation, dairy farming, poultry farming and live stock.

The function of private investment in agriculture sector is as follows:

P_{agri} = f (Vagc , Vagri, CAagr ,Rm , Kstock , Popg , Ipk, rw)   2.8

The corresponding regression/econometric equation of the above given function is given below:

$$P_{agri} = (\alpha_0 + \alpha_1 V_{agc} + \alpha_2 V_{agri} + \alpha_3 CA_{agri} + \alpha_4 K_{stock} + \alpha_5 R_m + \alpha_6 Pop_g + \alpha_7 I_{pk} + \alpha_8 r_w + \varepsilon_{pat})\ldots\ldots\ldots2.8a$$

The sign of the coefficient is expected to be;

$$\alpha_1 > 0, \alpha_2 > 0, \alpha_3 > 0, \alpha_4 > 0, \alpha_5 > 0, \alpha_6 > 0, \alpha_7 < 0, \alpha_8 < 0$$

The niceties of variables that are included in the study are given below;

Pagri = Private Investment in Agriculture Sector
Vagc = Value-Added in Agriculture Crop Sector
Vagri= Value-Added in Agriculture Sector
CAagri = Credit Available to Agriculture Sector
Kstock = Capital Stock in Agriculture Sector
Popg = Population Growth Rate
Rm = Remittances
Ipk = Index of Price of Capital
rw = Weighted Rate of Interest

3. Analytical Technique and Results

This section briefly incorporates the analytical techniques includes the unit root test and regression analysis. Further, the interpretation of results is also presented in this section.

3.1. Augmented Dicky-Fuller Unit root Test

Augmented Dicky-Fuller is the popular and predestined test for the time series data. The time series analysis have suspicious of spurus relation, therefore, the unit root test applied to detect the spurus relation and check the stationarity of the data. The unit root also gave direction for applying an appropriate method of regression analysis. As this research study too consist on time series data, therefore, before going to the regression analysis, the data was checked through Augmented Dicky-Fuller (ADF) unit root test for the sationarity. The results of unit root applied at Level are given in table 3.1.

Table 3.1:
The ADF Unit Root Test Results For The Stationarity Of Data At Level

Variables	*Abbreviations*	*Augmented Dickey Fuller*	*Critical Value (ADF)*
Private Investment in Agri Sector	P_{agri}	*-0.575550*	*-2.9750*
Value Added to Agri Crop Sector	V_{agc}	*-0.188343*	*-2.9750*
Value Added to Agri Sector	V_{agri}	*- 1.903122*	*-2.9750*
Credit Available to Agri Sector	C_{agri}	*-1.242618*	*-2.9750*
Capital Stock to Agrri Sector	*Kstock*	*-0.680646*	*-2.9750*
Remittances	R_m	*- 2.394692*	*-2.9750*
Population Density or growth	P_{opg}	*-2.122761*	*-2.9750*
Index of price of Capital	I_{pk}	*-2.468468*	*-2.9750*
Weighted Interest Rate	r_w	*-1.389892*	*-2.9750*

Note: *The variable are taken in their log form and Critical value is selected at 5% significance level*

The above table shows that all variables are non-stationary and the null hypothesis is accepted, that the variables has unit root. The hypothesis is tested by comparing the Augmented-Dicky Fuller value with critical value at 5% significance level. Now, the ADF for first difference is applied to check the stationary at first difference. The results of ADF first difference is given in table 3.2.

Table 3.2:
The ADF Unit Root Test Results for the Stationarity of Data at First Difference

Variables	Abbreviations	Augmented Dickey Fuller	Critical Value (ADF)
Private Investment in Agri Sector	P_{agri}	-3.839984	-2.9750
Value Added to Agri Crop Sector	V_{agc}	-4.081639	-2.9750
Value Added to Agri Sector	V_{agri}	-4.252524	-2.9750
Credit Available to Agri Sector	C_{agri}	-3.762040	-2.9750
Capital Stock to Agrri Sector	Kstock	-3.915789	-2.9750
Remittances	R_m	-4.526365	-2.9750
Population Density or growth	P_{opg}	-3.840854	-2.9750
Index of price of Capital	I_{pk}	-4.362324	-2.9750
Weighted Interest Rate	r_w	-3.424499	-2.9750

Note: *The variable are taken in their log form and Critical value is selected at 5% significance level*

The results incorporated in table 3.2 shows that all the variables are stationary at first difference, accepting the Alternative hypothesis and rejecting the null hypothesis that the variables are unit root. The situation when all the variables are stationary the researchers and economist prefer the Co-integration and VAR or VECM for the regression analysis.

3.2. Co-integration Test

Co-integration test are applied to find out that either the variables are co-integrated with each other or not. Secondly, co-integration test also gives the direction that the variables have long run or short run relation. As the ADF unit root test in table (3.2) confirms that the variables are stationary at first difference, further to find out the co-integrating factor and long run relation the Johansen Co-integration test has applied. The results are incorporated in table 3.3.

Table 3.3:
Results of Johansen Co-integration test

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.994324	483.7643	156.00	168.36	None **
0.978342	338.9605	124.24	133.57	At most 1 **
0.959458	231.6540	94.15	103.18	At most 2 **
0.931759	141.9022	68.52	76.07	At most 3 **
0.685204	66.73009	47.21	54.46	At most 4 **
0.611941	34.36686	29.68	35.65	At most 5 *
0.200699	7.862084	15.41	20.04	At most 6

| 0.055190 | 1.589603 | 3.76 | 6.65 | At most 7 |

(**) denotes rejection of the hypothesis at 5 %(1%) significance level
L.R. test indicates 6 co-integrating equation(s) at 5% significance level

The Johansen co-integration results incorporated in table 3.3 shows that the variables are co-integrated and have long run relation. It means that these motivated variables have long term impact on private investment in agriculture sector. Further, the results obtained from co- integration regression shows that there six (06) co-integrating equations in the included model variables of this research study. This explains that these variables are closely correlated with each other as well as with the dependent variable having strong effect on private investment on agriculture sector. Thus, here the [3]Null Hypothesis is rejected and [4]Alternative is accepted. As the variables are co-integrated and have long run relation, so, in this situation the preferable analytical technique for the regression analysis is Vector Error Correction Model (VECM).

3.3. Private Investment in Agriculture Sector

Agriculture being the dominant sector of the economy contributes one fourth to the Gross Domestic Product of Pakistan, as a major suppliers of raw materials to the industry as well as market for the industrial products and contributes substantially to Pakistan's exports earnings. Private investment in agriculture sector regressed against a number of variables i.e. the dependent variable is Private Investment in Agriculture Sector (Pagri), while the independent variables are Value-Added/output in Agriculture Crop Sector (Vagc), Value-Added in Agriculture Sector (Vagri), Credit Available to Agriculture Sector (CAagri), Capital Stock in Agriculture Sector (Kstock), Remittances (Rm), Population Growth Rate of Pakistan (Popg), Index of Price of Capital (Ipk) and Weighted Rate of Interest (rw), The Investment Accelerator Model is regressed through Vector Error Correction Model (VECM) and the results are in below table 3.4.

Table: 3.4.
Regression Results of Private Investment in Agriculture Sector as Dependent Variable are:

Dependent Variable	Independent Variables								
P_{agri}	C	V_{agc}	V_{agri}	C_{agri}	$Kstock$	R_m	P_{pog}	I_{pk}	r_w
1	0.84 (2.54)**	0.21 (1.84)*	0.12 (2.74)*	0.15 (4.54)*	0.33 (2.96)*	0.09 (5.67)*	0.30 (1.85)*	-0.07 (1.78)*	-0.13 (2.36)*
R-Squared		**0.974189**	**Adj. R-Squared**		**0.936645**	**F-Statics**			**866.1581**

Note: () parenthesis shows t-statistics values. * & ** shows the significance at 1% & 5% respectively.

The regression result obtained from the analysis of Vector Error Correction Model (VECM) integrated in table 3.4 shows that the overall performance of the model is

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[3] H_0 is that there is "NO" co-integrated Vector.

[4] H_1 is that there is Co-integrated Vector.

considerable. The F-stat value is (866) showing the significance of the overall model. The R-squared value is (0.97) explaining the glowing variation and rejoinder of independent variables towards the dependent variable demonstrating the goodness of fit of the model. The coefficients of the variables are also significant at 1% and 5% having the expected true values.

It is evident from the results in table 3.4 that the Value-Added in Agriculture Crop Sector is significant having positive impact on the Private Investment in Agriculture Sector. The coefficient value has (0.21), that means that 1% change in Value-Added in Agriculture Crop Sector bring twenty-one percent increase on average Private investment in agriculture sector.

Value-Added in Agriculture Sector has significant positive impact on Private Investment in Agriculture Sector. The value of the coefficient of Value-Added in Agriculture Sector is (0.12), that means that one percent increase in this variables will bring eleven (11 percent increase in investment of private sector in agriculture. The outcome is fairly reliable and the result shows that Value-Added in Agriculture Sector is very imperative for investment in this sector.

Credit Available plays a crucial role in private investment to the Agriculture Sector. The coefficient of Credit variable is highly significant and positive in the model. The coefficient value obtained by credit means that 1% percent available credit motivates individual's to invest more and raises overall fifteen percent private investment in the Agriculture Sector of Pakistan.

The worker's remittances are highly significant as seen from the results incorporated in table 3.4. The remittances has strong effect on the private investment as one percent increase in remittance will increase the private investment in agriculture sector of Pakistan on average up to nine percent.

The stock of capital has always played an important role in any sector of the economy. The results obtained from the regression analysis of the variables in this research study showing that capital stock is playing an important role in private investment in agriculture sector of Pakistan too. The coefficient value of capital stock is (0.33) having significant positive, indicates that one percent increase will raise thirty-three percent of Private investment in agriculture sector

The co-efficient of Population Growth Rate is (0.30) with positive value and significant, which means that one percent increase in population will result an increase of thirty percent on average in Private investment in agriculture sector. Increase in population will enhance demand for food and agriculture related goods, which will ultimately raise overall investment level in agriculture.

There is negative and significant effect of Index of Price of Capital and Weighted Rate of Interest on Private investment in agriculture sector. The coefficient of Index of Price of Capital and Weighted Rate of Interest are (-0.07) and (-0.13), indicates that one percent increase in Index of Price of Capital and Weighted Rate of Interest will bring seven and thirteen percent decrease in Private investment in agriculture sector respectively. These two variables can be assumed as opportunity cost of capital.

3. Conclusion
This research study ventured to ascertain the motivated factors that have significant contribution in the private investment that leads to an increase the investment in agriculture sector of Pakistan. The results reveal that demand is the most important determinant of

investment activity, employing that the 'accelerator model' explains the investment behavior for private investment in agriculture sector quite significantly. In addition to these, a number of factors such as credit availability, profitability, capital stock etc also have significant impact. The private investment declined sharply during early 1970's and remained very low till early 1980's due to nationalization policy and the lack of confidence among business community resulting from uncertain political condition and unfavorable economic conditions. After this period, through the process of privatization the private investment regained some strength due to visible tendency towards political stability and inclination towards encouragement of private sector.

The study recommends that government can increase domestic purchasing power through export expansion and import substitutions as well as by assets redistribution. But all these policies may be difficult to implement in that they have other impacts on the domestic economy. Export expansion and import substitution may be quite desirable for increasing demand. Government should take into consideration not only the conditions in domestic economy but also the international economy and finally the assets redistribution to encourage the private investment in agriculture sector of Pakistan.

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