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An Analysis of the Factors Contributing to the Increase in Public Debt in Punjab

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A B S T R A C T

This study investigates the escalating public debt in Punjab, India, by examining the relationship between total revenue, budget deficit, and other economic factors. Utilizing correlation, adjusted R-square, and p-value analyses, the research evaluates the impact of infrastructure investment, interest payments on the state's fiscal health. The findings reveal a significant positive correlation between total revenue and budget deficit, indicating that increased revenue does not necessarily mitigate fiscal deficits. Additionally, the study highlights the inefficient utilization of borrowed funds, with a substantial portion allocated to non-productive activities. The research underscores the need for strategic financial management, including exploring alternative financing sources such as public-private partnerships and foreign direct investment, to ensure long-term fiscal sustainability and economic stability in Punjab.

Keywords: public debt, total revenue, budget deficit, infrastructure investment, interest payment, fiscal health, economic factors, financing sources

1. Introduction

Punjab's economic landscape has undergone significant transformations over the past few decades. From being an agrarian economy to embracing industrialization, the state's fiscal policies have played a crucial role in shaping its financial health. In recent years, Punjab has faced mounting public debt, raising concerns about fiscal sustainability. The state's reliance on borrowing to finance budget deficits has led to a growing debt burden. This persistent deficit spending has created a widening fiscal gap.

This study aims to explore the underlying reasons for this rise in public debt and its implications for the state's economic stability. Analyzing the factors contributing to Punjab's public debt is vital for policymakers and stakeholders. By identifying the key drivers of debt accumulation, this study seeks to provide insights that can inform future fiscal strategies and promote sustainable economic growth in the state. The analysis employs tools such as correlation, adjusted R square, and p-value to determine the significance of these relationships.

The findings reveal a consistent increase in Punjab's outstanding debt over the years, with notable spikes due to exceptional financial events. The study highlights the importance of managing public debt effectively to ensure fiscal sustainability and economic stability. It also underscores the need for strategic investments and prudent financial management to mitigate the growing debt burden relative to the state's economic output.

2. Hypotheses

2.1 Hypotheses to evaluate various factors affecting total revenue of Punjab state

H0: There is no significant relationship between total revenue and budget deficit.H1: There is a significant relationship between total revenue and budget deficit.

H0: There is no significant relationship between total revenue and infrastructure investment.

H1: There is a significant relationship between total revenue and infrastructure investment.

H0: There is no significant relationship between total revenue and total interest payment.

H1: There is a significant relationship between total revenue and total interest payment.

2.2 Hypotheses to evaluate the relationship between budget deficit and other factors affecting budget deficit of Punjab state

H0: There is no significant relationship between budget deficit and infrastructure investment.

H1: There is a significant relationship between budget deficit and infrastructure investment.

H0: There is no significant relationship between budget deficit and total interest payment.

H1: There is a significant relationship between budget deficit and total interest payment.

3. Research Methodology:

To deliberate upon the hypotheses that have been framed, the following statistical tools and methods have been used:

- Correlation – It is defined as, the relationship between two things. When two things are correlated, they change in a predictable way. Correlation helps us to understand how two things are related and how the changes in one thing might affect the other.
- Adjusted R Square – It is a measure used in regression analysis to understand how well model fits the data. It's important to remember that adjusted R square can be influenced by the number of variables in the model, so it's essential to interpret it carefully.
- P-value - The p-value is a measure used in statistical hypothesis testing to determine the significance of results. It tells you the probability of getting the observed results or more extreme results if the null hypothesis is true. In general, a p-value less than 0.05 is considered statistically significant. This means that there's less than a 5% chance of getting the results by random chance alone, and you can reject the null hypothesis. On the other hand, a p-value greater than 0.05 suggests that the results are not statistically significant, and you fail to reject the null hypothesis.

4. Data Analysis and Interpretation

To evaluate and establish the relationship between total revenue, budget deficit and other factors affecting these parameters in Punjab state, a wide array of data has been collected and studied. The interpretations underscore the need for strategic financial management so as to improve the state's fiscal health.

Table 1 – Outstanding Debts (including reserves and deposits) of Punjab

Year	Outstanding Debt (in Crore)	% Change	GSDP (in Crore)	% Change
2001-2002	29,099.00		72,897.00	
2010-2011	74,777.00	3.89	1,92,648.00	6.21
2011-2012	83,099.00	11.13	2,56,374.00	13.34
2012-2013	92,281.00	11.05	2,97,734.00	16.13
2013-2014	1,02,235.00	10.79	3,32,147.00	11.56
2014-2015	1,05,366.00	3.06	3,55,102.00	6.91
2015-2016	129441*	22.85	3,92,411.00	10.51
2016-2017	182257**	40.8	4,33,660.00	10.51
2017-2018	1,95,458.00	7.24	4,70,137.00	8.41
2018-2019	2,11,896.00	8.41	5,21,861.00	11
2019-2020	2,29,390.00	8.26	5,74,760.00	10.14
2020-2021	2,61,239.00	13.88	6,06,530.00	5.53
2021-2022	2,82,062.00	7.97	6,07,594.00	0.18
TGR (2001-2002 to 2021-2022)	**12.44**		**10.16**	

*** Uday Scheme.**

**** This abnormal increase was due to the conversion of CCL Gap of Rs 30,584.11 crore in to long term debt.**

Source: Punjab Budgets, Department of Finance, Punjab (Various Report)

The table shows Punjab's outstanding debt in crores of rupees and the percentage change in both debt and Gross State Domestic Product (GSDP) from 2001-2002 to 2021-2022. It reveals a consistent increase in outstanding debt over the years, with a total growth rate (TGR) of 12.44% during the period. The significant increase in debt from 2015-2016 to 2016-2017, with an extraordinary 40.8% rise, attributed to the conversion of a Commercial Crop Loan (CCL) gap of Rs 30,584.11 crore into long-term debt. This anomaly highlights the impact of exceptional financial events on debt levels and the importance of understanding such events when analysing debt trends. The percentage change in GSDP also fluctuates, reflecting varying economic conditions and growth rates in Punjab. Despite these fluctuations, the debt growth rate has consistently outpaced the GSDP growth rate, indicating a growing debt burden relative to the state's economic output. The table underscores the importance of managing public debt effectively to ensure fiscal sustainability and economic stability in Punjab. An analysis of composition of Punjab's outstanding debt over the years revealed few interesting trends. Firstly, the internal debt and public account liabilities together constituted a large portion of the outstanding debt as on March 31,2021. The share which is one - third of outstanding debt in 2000-01, went up to 73.29% in 2011-12 and more than 82 percent since 2016-17 onwards. On the other hand, the share of loans and advances from the centre declined very sharply from 40.7% percent in 2000-01 to 3.92% in 2011-12 to nearly 2.0% since 2016-17 onwards. This change was happened largely in pursuance of the recommendations of the 13th UFC and 14th UFC. The remaining share 16% concerned by the other liabilities consisting of provident fund of employees, and reserve funds & deposits with the RBI.

Further, among the different components of internal debt during 2000-01, the share of the National Small Saving Fund, or NSSF, was 13.89%, followed by market loans 8.92% and loans from State Bank of India (SBI)/ other banks 6.67%, compensation & other bonds 2.45% and the National Bank for Agriculture and Rural Development, NABARD loan 1.10%. During 2020-21 market loans constituted 59.16% share of outstanding debt, followed by the loans from SBI/ other banks 14.86%, compensation & other bonds 6.31%, NSSF loans 6.00% and NABARD loan 0.74%. It means that over the years, market loans and loans from SBI and other banks have gained tremendous prominence over other types of debts. These have direct impact on the cost of borrowing funds, which will ultimately determine the State's total debt-servicing liabilities. The data reveal that the NSSF loans are the costliest loans compared to other types of loans. Similarly, even other types of loans such as the market loans, loans from the SBI/ other banks, provident fund, etc. were also negotiated at high interest rates than that of the prevalent rate against bonds. Although the loans from NABARD are available at lower interest rate, but its share in the total outstanding debt is too small. It means that most of the loans negotiated in the state bore high interest rates. These high-cost loans not only put an unavoidable burden on the debt servicing, but also restrict the state's available fiscal space to finance productive and developmental expenditures. It is interesting to note that Punjab had continuously expressed in the past its intention to have a debt swap and replace the high cost NSSF loans with newer low-cost market loans. The government of India has consistently refused the repayment and swapping of NSSF loans.

Table 2 - Relationship between Total Revenue and Budget Deficit of Punjab State

Year	Total Revenue (in Cr)	Budget Deficit (in Cr)
2001-2002	14422	1178
2002-2003	14431	656
2003-2004	14673	1317
2004-2005	15232	1345
2005-2006	15858	1413
2006-2007	16795	2635
2007-2008	19238	785
2008-2009	20713	2834
2009-2010	22157	919
2010-2011	27608	1854
2011-2012	26234	1680
2012-2013	32051	1939
2013-2014	35104	2253
2014-2015	39023	3250
2015-2016	41523	3212
2016-2017	47985	5110
2017-2018	53010	3039
2018-2019	62269	2924

2019-2020	61575	2541
2020-2021	69048	5288
2021-2022	78137	11446
2022-2023	93563	7885
2023-2024	**98852**	10195

The correlation between total revenue and budget deficit is 0.864.This clearly indicates a strong positive linear relationship between total revenue and budget deficit. This means that as total revenue increases, the budget deficit also tends to increase, and vice versa. The closer the correlation coefficient is to 1, the stronger the positive linear relationship. This further suggests that changes in total revenue are closely related to changes in the budget deficit, and understanding one variable can help predict the other. A higher total revenue generally leads to a lower budget deficit or even a budget surplus, as the government has more funds to cover its expenses. This can result in a more stable fiscal situation, lower borrowing costs, and a stronger overall economy. However, it's important to note that correlation does not imply causation, so further analysis would be needed to determine the underlying factors driving this relationship. After evaluating the above data we find the value of an adjusted R Square. The value of adjusted R square 0.735 indicates that approximately 73.53% of the variability in the budget deficit can be explained by the variability in total revenue. In other words, the model that uses total revenue to predict the budget deficit is able to account for about 73.53% of the variability in the actual budget deficit values. This suggests a reasonably strong relationship between total revenue and the budget deficit, indicating that changes in total revenue are a significant factor in explaining changes in the budget deficit. However, it also implies that there are other factors not included in the model that contribute to the variability in the budget deficit. The p-value is 0.353. A p-value of 0.353 suggests that there is no statistically significant relationship between total revenue and budget deficit. In other words, the result is not strong enough to reject the null hypothesis, which typically states that there is no relationship between the two variables. This means that the observed data is reasonably likely to occur even if there is no true relationship between total revenue and budget deficit. There are several reasons why a budget deficit may increase. One common reason is a decline in tax revenue due to economic downturns or changes in tax policies that reduce overall tax receipts. When tax revenue decreases, but government spending remains constant or increases, it can lead to a larger budget deficit. Another factor that can contribute to an increase in the budget deficit is an increase in government spending. This can occur due to high expenditures on social programs, defence, infrastructure, or other areas. If spending increases are not offset by corresponding increases in revenue, it can result in a larger budget deficit. Additionally, external factors such as changes in interest rates or exchange rates can affect the budget deficit. For example, an increase in interest rates can lead to higher interest payments on government debt, increasing the deficit.

Table 3 - Relationship between Total Revenue and Total Interest Payment of Punjab State

Year	**Total Revenue (in Cr)**	**Total Interest Payment (in Cr)**
2001 – 2002	14422	3178
2002 – 2003	14431	3434
2003 – 2004	14673	3712
2004 – 2005	15232	3872.12
2005 – 2006	15858	4002.75
2006 – 2007	16795	4152
2007 – 2008	19238	4527
2008 – 2009	20713	4902
2009 – 2010	22157	5011
2010 – 2011	27608	5515
2011 – 2012	26234	6280
2012 – 2013	32051	6831
2013 – 2014	35104	7820
2014 – 2015	39023	8960
2015 – 2016	41523	9782

2016 – 2017	47985	11642
2017 – 2018	53010	15334
2018 – 2019	62269	16306
2019 – 2020	61575	17567
2020 – 2021	69048	18153
2021 – 2022	78137	17071
2022 – 2023	93563	21122
2023 - 2024	98852	23000

A correlation of 0.985 between total revenue and total interest payment indicates a very strong positive relationship between these two variables. This means that as total revenue increases, total interest payment also tends to increase, and vice versa.

In the context of financial analysis, such a high correlation indicates that changes in total revenue are closely associated with changes in total interest payment. This could be due to various factors such as the size of debt, interest rates, and the overall financial health of the entity. Understanding this relationship is important for financial planning and risk management, as it can help anticipate changes in interest payments based on changes in revenue. After evaluating the above data we found the value of an adjusted R-square 0.968 between total revenue and total interest payment indicates that approximately 96.8% of the variability in total interest payment can be explained by the variability in total revenue. This means that total revenue is a very strong predictor of total interest payment. This further indicates that high adjusted R-square value suggests that total revenue is a significant factor in determining the total interest payment. Changes in total revenue are likely to lead to proportional changes in total interest payment. This information can be valuable for financial planning and decision-making, as it highlights the importance of monitoring and managing total revenue to control interest payment costs. The p-value is 0.54.A p-value of 0.54 indicates that there is not a statistically significant relationship between total revenue and total interest payment. In hypothesis testing, the p-value represents the probability of observing the data or more extreme results if the null hypothesis is true. Here, the null hypothesis would be that there is no relationship between total revenue and total interest payment. Since the p-value is greater than the commonly used significance level of 0.05, we fail to reject the null hypothesis. This suggests that there is insufficient evidence to conclude that there is a relationship between total revenue and total interest payment based on the data analysed.

Table 4 - Relationship between Total Revenue and Total Interest Payment of Punjab State

Year	Total Revenue (in Cr)	Total Interest Payment (in Cr)
2001 – 2002	14422	3178
2002 – 2003	14431	3434
2003 – 2004	14673	3712
2004 – 2005	15232	3872.12
2005 – 2006	15858	4002.75
2006 – 2007	16795	4152
2007 – 2008	19238	4527
2008 – 2009	20713	4902
2009 – 2010	22157	5011
2010 – 2011	27608	5515
2011 – 2012	26234	6280
2012 – 2013	32051	6831
2013 – 2014	35104	7820
2014 – 2015	39023	8960
2015 – 2016	41523	9782

2016 – 2017	47985	11642
2017 – 2018	53010	15334
2018 – 2019	62269	16306
2019 – 2020	61575	17567
2020 – 2021	69048	18153
2021 – 2022	78137	17071
2022 – 2023	93563	21122
2023 - 2024	98852	23000

A correlation of 0.985 between total revenue and total interest payment indicates a very strong positive relationship between these two variables. This means that as total revenue increases, total interest payment also tends to increase, and vice versa.

In the context of financial analysis, such a high correlation indicates that changes in total revenue are closely associated with changes in total interest payment. This could be due to various factors such as the size of debt, interest rates, and the overall financial health of the entity. Understanding this relationship is important for financial planning and risk management, as it can help anticipate changes in interest payments based on changes in revenue. After evaluating the above data we found the value of an adjusted R-square 0.968 between total revenue and total interest payment indicates that approximately 96.8% of the variability in total interest payment can be explained by the variability in total revenue. This means that total revenue is a very strong predictor of total interest payment.

This further indicates that high adjusted R-square value suggests that total revenue is a significant factor in determining the total interest payment. Changes in total revenue are likely to lead to proportional changes in total interest payment. This information can be valuable for financial planning and decision-making, as it highlights the importance of monitoring and managing total revenue to control interest payment costs. p-value is 0.54.A p-value of 0.54 indicates that there is not a statistically significant relationship between total revenue and total interest payment. In hypothesis testing, the p-value represents the probability of observing the data or more extreme results if the null hypothesis is true. Here, the null hypothesis would be that there is no relationship between total revenue and total interest payment. Since the p-value is greater than the commonly used significance level of 0.05, we fail to reject the null hypothesis. This suggests that there is insufficient evidence to conclude that there is a relationship between total revenue and total interest payment based on the data analysed.

Table 5 - Relationship between Budget Deficit and Infrastructure Investment of Punjab State

Year	**Budget Deficit (in Cr)**	**Infrastructure Investment (in Cr)**
2001 – 2002	1178	984.34
2002 – 2003	656	420.4
2003 – 2004	1317	1507.05
2004 – 2005	1345	2554.69
2005 – 2006	1413	2064.27
2006 – 2007	2635	2586
2007 – 2008	785	2192
2008 – 2009	2834	2858
2009 – 2010	919	2166
2010 – 2011	1854	2384
2011 – 2012	1680	1598
2012 – 2013	1939	1916
2013 – 2014	2253	2201
2014 – 2015	3250	3118
2015 – 2016	3212	3059

2016 – 2017	5110	4346
2017 – 2018	3039	2352
2018 – 2019	2924	2412
2019 – 2020	2541	2199
2020 – 2021	5288	4382
2021 – 2022	11446	8203
2022 – 2023	7885	8513
2023 – 2024	10195	10354

A correlation of 0.952 between budget deficit and infrastructure investment indicates a very strong positive relationship between these two variables. This means that as the budget deficit increases, there is a high tendency for infrastructure investment to increase as well, and vice versa. In other words, there is a strong positive association between budget deficit and infrastructure investment, suggesting that areas or governments with higher budget deficits are likely to invest more in infrastructure, and areas with lower budget deficits are likely to invest less in infrastructure.

This strong correlation implies that changes in the budget deficit can be closely linked to changes in infrastructure investment. It suggests that the budget deficit can be a good indicator or predictor of infrastructure investment within a given government or area. This relationship highlights the importance of fiscal factors in influencing infrastructure development and underscores the potential impact of budgetary policies on infrastructure investment. After evaluating the above data we find the value of an adjusted R-square. The value of an adjusted R Square 0.903 between budget deficit and infrastructure investment indicates a strong relationship between these two variables. The adjusted R-squared value represents the proportion of the variance in one variable (infrastructure investment) that is predictable from the other variable (budget deficit) in a regression model. In this case, the adjusted R-squared value suggests that approximately 90.3% of the variation in infrastructure investment can be explained by the budget deficit, after accounting for the number of predictors in the model. This high adjusted R-squared value indicates that the budget deficit is a good predictor of infrastructure investment, with only a small amount of the variation in infrastructure investment remaining unexplained by the budget deficit. Therefore, the model including the budget deficit as a predictor is likely to be effective in predicting infrastructure investment levels, making the budget deficit a key factor to consider in understanding and managing infrastructure development. p-value is 0.31. A p-value of 0.31 indicates that there is not a statistically significant relationship between budget deficit and infrastructure investment. In hypothesis testing, the p-value represents the probability of observing the data or more extreme results if the null hypothesis is true. Here, the null hypothesis would be that there is no relationship between budget deficit and infrastructure investment. Since the p-value is greater than the commonly used significance level of 0.05, we fail to reject the null hypothesis. This suggests that there is insufficient evidence to conclude that there is a relationship between budget deficit and infrastructure investment based on the data analysed.

Table 6 - Relationship between Budget Deficit and Total Interest Payment of Punjab State

Year	**Budget Deficit (in Cr)**	**Total Interest Payment (in Cr)**
2001 – 2002	1178	3178
2002 – 2003	656	3434
2003 – 2004	1317	3712
2004 – 2005	1345	3872.12
2005 – 2006	1413	4002.75
2006 – 2007	2635	4152
2007 – 2008	785	4527
2008 – 2009	2834	4902
2009 – 2010	919	5011
2010 – 2011	1854	5515
2011 – 2012	1680	6280
2012 – 2013	1939	6831
2013 – 2014	2253	7820

2014 – 2015	3250	8960
2015 – 2016	3212	9782
2016 – 2017	5110	11642
2017 – 2018	3039	15334
2018 – 2019	2924	16306
2019 – 2020	2541	17567
2020 – 2021	5288	18153
2021 – 2022	11446	17071
2022 – 2023	7885	21122
2023 - 2024	10195	23000

A correlation of 0.796 between budget deficit and total interest payment indicates a strong positive relationship between these two variables. This means that as the budget deficit increases, there is a high tendency for total interest payments to increase as well, and vice versa. In other words, there is a strong positive association between budget deficit and total interest payments, suggesting that areas or governments with higher budget deficits are likely to incur higher interest payments, and areas with lower budget deficits are likely to incur lower interest payments.

This strong correlation implies that changes in the budget deficit can be closely linked to changes in total interest payments. It suggests that the budget deficit can be a good indicator or predictor of total interest payments within a given government or area. This relationship highlights the importance of fiscal factors in influencing the cost of borrowing and underscores the potential impact of budgetary policies on total interest payments and overall debt management. After evaluating the above data we find the value an adjusted R-square. The value of an adjusted R square is 0.617 between budget deficit and total interest payment indicates a moderate to strong relationship between these two variables. The adjusted R-squared value represents the proportion of the variance in one variable (total interest payment) that is predictable from the other variable (budget deficit) in a regression model. In this case, the adjusted R-squared value suggests that approximately 61.7% of the variation in total interest payments can be explained by the budget deficit, after accounting for the number of predictors in the model.

This moderate to strong adjusted R-squared value indicates that the budget deficit is a moderate to strong predictor of total interest payments, with a significant amount of the variation in total interest payments being explained by the budget deficit. Therefore, the model including the budget deficit as a predictor is likely to be moderately to strongly effective in predicting total interest payments, making the budget deficit an important factor to consider in understanding and managing total interest payments and overall debt servicing costs. p-value is 0.76.A p-value of 0.76 indicates that there is not a statistically significant relationship between budget deficit and total interest payment. In hypothesis testing, the p-value represents the probability of observing the data or more extreme results if the null hypothesis is true. Here, the null hypothesis would be that there is no relationship between budget deficit and total interest payment. Since the p-value is greater than the commonly used significance level of 0.05, we fail to reject the null hypothesis. This suggests that there is insufficient evidence to conclude that there is a relationship between budget deficit and total interest payment based on the data analysed.

5. Finding and Conclusion

5.1 Findings:

- The significant role played by the state government's reliance on borrowings to finance its budget deficit. Punjab has consistently spent more than it has earned, leading to a widening fiscal gap that has necessitated extensive borrowing from both domestic and external sources. This persistent deficit spending has contributed significantly to the accumulation of public debt in the state.
- Another finding of the study is the inefficient utilization of borrowed funds. Despite borrowing substantial amounts, Punjab has failed to generate adequate returns on these investments. A large portion of the borrowed funds has been used to finance non-productive activities, such as subsidies and administrative expenses, rather than productive investments that could yield long-term benefits.
- The study suggests exploring alternative sources of financing, such as public-private partnerships and foreign direct investment, to reduce reliance on borrowings. By diversifying its sources of funding, Punjab can reduce its vulnerability to external economic shocks and achieve a more sustainable fiscal position in the long run.
- In conclusion, the study on the public debt of Punjab provides valuable insights into the reasons behind the rise in the state's debt levels. By implementing the right policy measures, Punjab can gradually reduce its debt burden and achieve fiscal sustainability.

5.2 Conclusion:

- In conclusion, the study shows that Punjab's public debt has increased mainly because the government has been spending more money than it earns. To cover this gap, the government has been borrowing money from different sources, both inside and outside the country. However, much of this borrowed money has not been used wisely. Instead of investing in projects that could help the state grow and generate more income, a large part of the borrowed money has been used for things like subsidies and administrative expenses that do not bring in any returns.
- The study also highlights that Punjab's economy has not been growing as expected, which has limited the government's ability to generate more revenue. Additionally, global economic conditions and fluctuations in interest rates have made it more expensive for Punjab to repay its debt.
- Punjab needs to increase its revenue and reduce unnecessary spending. It also recommends that the government use borrowed money more wisely, investing in projects that can help the state grow and generate more income in the long run.

5.3 Suggestions and Recommendations:

- The study suggests several ways for Punjab to address its rising public debt. One key recommendation is to focus on reducing the budget deficit, which means spending less than what the government earns. This can be done by increasing revenue through tax reforms that make sure everyone pays their fair share of taxes. The government can also cut down on non-essential spending to reduce the need for borrowing.
- Secondly, to use borrowed funds more wisely. Instead of spending money on things that do not bring in any returns, like subsidies, the government should invest in projects that can help the state grow and generate more income in the long term. This could include infrastructure projects like building roads and bridges, which can create jobs and stimulate economic growth.
- The study recommends exploring alternative sources of financing, such as public-private partnerships and foreign direct investment. By diversifying its sources of funding, Punjab can reduce its reliance on borrowing and make its finances more sustainable in the long run.

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