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Rajiv Gandhi University

BAECO 303 PUBLIC FINANCE AND STATISTICS-II



BA (ECONOMICS)
6th SEMESTER

Rajiv Gandhi University

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PUBLIC FINANCE AND STATISTICS - II

BA [Economics]

Sixth Semester

BAECO-303



RAJIV GANDHI UNIVERSITY

Arunachal Pradesh, INDIA - 791 112

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About the University

Rajiv Gandhi University (formerly Arunachal University) is a premier institution for higher education in the state of Arunachal Pradesh and has completed twenty-five years of its existence. Late Smt. Indira Gandhi, the then Prime Minister of India, laid the foundation stone of the university on 4th February, 1984 at Rono Hills, where the present campus is located.

Ever since its inception, the university has been trying to achieve excellence and fulfill the objectives envisaged in the University Act. The university received academic recognition under Section 2(f) from the University Grants Commission on 28th March, 1985 and started functioning from 1st April, 1985. It got financial recognition under section 12-B of the UGC on 25th March, 1994. Since then Rajiv Gandhi University, (then Arunachal University) has carved a niche for itself in the educational scenario of the country following its selection as a University with potential for excellence by a high-level expert committee of the University Grants Commission from among universities in India.

The University was converted into a Central University with effect from 9th April, 2007 as per notification of the Ministry of Human Resource Development, Government of India.

The University is located atop Rono Hills on a picturesque tableland of 302 acres overlooking the river Dikrong. It is 6.5 km from the National Highway 52-A and 25 km from Itanagar, the State capital. The campus is linked with the National Highway by the Dikrong bridge.

The teaching and research programmes of the University are designed with a view to play a positive role in the socio-economic and cultural development of the State. The University offers Undergraduate, Post-graduate, M.Phil and Ph.D. programmes. The Department of Education also offers the B.Ed. programme.

There are fifteen colleges affiliated to the University. The University has been extending educational facilities to students from the neighbouring states, particularly Assam. The strength of students in different departments of the University and in affiliated colleges has been steadily increasing.

The faculty members have been actively engaged in research activities with financial support from UGC and other funding agencies. Since inception, a number of proposals on research projects have been sanctioned by various funding agencies to the University. Various departments have organized numerous seminars, workshops and conferences. Many faculty members have participated in national and international conferences and seminars held within the country and abroad. Eminent scholars and distinguished personalities have visited the University and delivered lectures on various disciplines.

The academic year 2000-2001 was a year of consolidation for the University. The switch over from the annual to the semester system took off smoothly and the performance of the students registered a marked improvement. Various syllabi designed by Boards of Post-graduate Studies (BPGS) have been implemented. VSAT facility installed by the ERNET India, New Delhi under the UGC-Infonet program, provides Internet access.

In spite of infrastructural constraints, the University has been maintaining its academic excellence. The University has strictly adhered to the academic calendar, conducted the examinations and declared the results on time. The students from the University have found placements not only in State and Central Government Services, but also in various institutions, industries and organizations. Many students have emerged successful in the National Eligibility Test (NET).

Since inception, the University has made significant progress in teaching, research, innovations in curriculum development and developing infrastructure.

SYLLABI-BOOK MAPPING TABLE

Public Finance and Statistics - II

Syllabi Book

Mapping in

Unit I: Government Budget

Revenue and Capital Budget; Revenue Expenditure and capital expenditure, Revenue Deficit, Fiscal Deficit, Primary Deficit; Counter Cyclical Fiscal Policy,

Unit II: Public Debt

Differences between private and public debt, sources of public debt, effects of government borrowing on aggregate Demand and Price level.

Unit III: Data

Primary and secondary sources of data, Collection and Tabulation of Data.

Unit IV: Central Tendency

Measures of Central tendency: Mean, Median, Mode (Both grouped and ungrouped Data), Range, Mean deviation and Standard Deviation as measures of Dispersion.

CONTENTS

INTRODUCTION

1

UNIT 4 GOVERNMENT BUDGET

113-135

- 4.0 Introduction
- 4.1 Unit Objectives
- 4.2 Indian Budget
- 4.3 Revenue and Capital Budget
 - 4.3.1 Revenue and Capital Expenditure
- 4.4 Revenue, Fiscal and Primary Deficit
- 4.5 Counter Cyclical Fiscal Policy
- 4.6 Summary
- 4.7 Key Terms
- 4.8 Answers to 'Check Your Progress'
- 4.9 Questions and Exercises
- 4.10 Further Reading

UNIT 5 PUBLIC DEBT

137-150

- 5.0 Introduction
- 5.1 Unit Objectives
- 5.2 Differences between Private and Public Debt
- 5.3 Sources of Public Debt
- 5.4 Effects of Government Borrowing
 - 5.4.1 Effects of Government Borrowing on Price Level and Aggregate Demand
- 5.5 Summary
- 5.6 Key Terms
- 5.7 Answers to 'Check Your Progress'
- 5.8 Questions and Exercises
- 5.9 Further Reading

UNIT 6 STATISTICS

151-190

- 6.0 Introduction
- 6.1 Unit Objectives
- 6.2 Primary and Secondary Sources of Data
- 6.3 collection and Tabulation of Data
 - 6.3.1 Types of Tables
- 6.4 Measures of Central Tendency
- 6.5 Measures of Dispersion
 - 6.5.1 Range
 - 6.5.2 Mean Deviation
 - 6.5.3 Standard Deviation
- 6.6 Summary
- 6.7 Key Terms
- 6.8 Answers to 'Check Your Progress'
- 6.9 Questions and Exercises
- 6.10 Further Reading

INTRODUCTION

Public finance studies the role of the government in the economy. It is the definitive branch of Economics which assesses the government revenue and government expenditure of the public authorities and the adjustment of one or the other to achieve desirable effects and avoid undesirable ones. Public finance is a subject which has the distinction of intimate interaction between theory and practice. As such it acquires a meaning and usefulness only in the context of institutional framework of the economy with reference to which it is being studied. The theoretical concepts and policy applications in public finance feed upon and grow out of each other. No single theoretical model can adequately fit in the framework of every economy since its institutional framework is a thing unique to itself. It is important, therefore, that the discussion of public finance should be in the context of a single economy.

Recent years have witnessed a heated debate on several theoretical and policy issues covering several segments of public finance, including the role of fiscal policy. Pleas are being made for a thorough restructuring of its various theoretical and policy premises and the framework within which these should be conducted. Exponential growth and transformation in global financial system and worldwide meltdown caused by it have fuelled rethinking on the role of fiscal policy with a special focus on economic stability and growth—both in developed and developing countries. India, like the rest of the world, has also been deeply affected by these developments.

Statistics is considered a mathematical science pertaining to the collection, analysis, interpretation or explanation and presentation of data. Statistical analysis is very important for taking decisions and is widely used by academic institutions, natural and social sciences departments, governments and business organizations. The subject of statistics deals primarily with numerical data gathered from surveys or collected using various statistical methods. Its objective is to summarize such data, so that the summary gives us a good indication about some characteristics of a population or phenomenon that we wish to study. To ensure that our conclusions are meaningful, it is necessary to subject our data to scientific analyses so that rational decisions can be made. Hence, the field of statistics is concerned with proper collection of data, organizing this data into manageable and presentable form, analysing and interpreting the data into conclusion for useful purposes.

This book, *Public Finance and Statistics*, has been written in the Self-Instructional Mode (SIM) wherein each unit begins with an 'Introduction' to the topic followed by an outline of the 'Unit Objectives'. The detailed content is then presented in a simple and an organized manner, interspersed with 'Check Your Progress' questions to test the understanding of the students. A 'Summary' along with a list of 'Key Terms' and a set of 'Questions and Exercises' is also provided at the end of each unit for effective recapitulation.

UNIT 4 GOVERNMENT BUDGET

Structure

- 4.0 Introduction
- 4.1 Unit Objectives
- 4.2 Indian Budget
- 4.3 Revenue and Capital Budget
 - 4.3.1 Revenue and Capital Expenditure
- 4.4 Revenue, Fiscal and Primary Deficit
- 4.5 Counter Cyclical Fiscal Policy
- 4.6 Summary
- 4.7 Key Terms
- 4.8 Answers to 'Check Your Progress'
- 4.9 Questions and Exercises
- 4.10 Further Reading

NOTES

4.0 INTRODUCTION

Budget is one of the most powerful instruments of legislative control and executive management as it effectively indicates the financial health of the country. Government's budget in India is normally presented in the month of February every year in the Parliament. You must have also observed that many days before the budget is presented, there are conjectures all round by the general public about the expected changes in taxes. The Union Budget for 2017-18 was announced by the Finance Minister, Mr Arun Jaitley, in Parliament on 1 February 2017. Budget 2017-18 contains three major reforms: advancement of date of presentation, merger of railway budget with general budget and abandoning of Plan and Non-Plan expenditure. In this unit, you will study about the presentation of Indian budget, revenue and capital budget, revenue and capital expenditure, revenue, fiscal and primary deficit and counter cyclical fiscal policy.

4.1 UNIT OBJECTIVES

After going through this unit, you will be able to:

- State the periodicity of Indian budget
- Discuss revenue and capital budget
- Analyse revenue and capital expenditure
- Define revenue, fiscal and primary deficit
- Interpret the problem of budget deficit in India

4.2 INDIAN BUDGET

In India, the actual financial statement of the Government of India incorporating item-wise proposed disbursements and estimated receipts for a specified period (normally a year) is termed its Budget Statement. Article 112 of the Constitution of India states that 'an annual financial statement' shall be placed before both Lok Sabha, and Rajya Sabha,

while Article 202 of the Constitution states that a similar financial statement for each State shall be placed before the Legislature of that State.

In India, all government accounts (of both the Centre and the States) are grouped into three parts, viz., (i) Consolidated Fund, (ii) Public Account and (iii) Contingency Fund.

All sums of money received by and belonging to GOI or States are credited to the **Consolidated Fund of India** or those of the respective States. For example, all revenues received by the Government of India, all loans raised by it through the issue of treasury bills, loans or ways and means advances and recoveries of loans are credited (with the exception of sums credited to the Contingency Fund of India) to the Consolidated Fund of India. No amount can be spent from this Fund without parliamentary sanction, except for certain expenditure items specified in the Constitution and 'charged' upon the Fund (such as the salaries of the Judges of the Supreme Court and Comptroller and Auditor General of India). These expenses are included in the budget but are not put to vote in parliament. Corresponding provisions govern the replenishments of the Consolidated Fund of a State and expenditure from it.

All sums of money received by the Centre or a State, but not belonging to it and held in trust, are credited to the **Public Account of India** or that of the concerned State. No legislative sanction is needed to make payments out of the Public Account.

The **Contingency Fund** consists of finances which are put at the disposal of the governments to meet unforeseen emergent expenses. A prior sanction of the parliament (for spending an amount out of the Contingency Fund of India) or of a State Legislature (for spending an amount out of the State Contingency Fund) is not needed. However, any such expenditure has to be approved later by the parliament or the State Legislature as the case be, and the Contingency Fund is to be replenished accordingly.

Contents of the Budget

In India, both the Central and State Budget Statements show the receipts and payments under the above mentioned three Accounts separately.

In India, a budget (whether Central or State) shows financial accounts of the previous year, the budget and revised estimates of the current year and the budget estimates for the forthcoming year. The estimates for the forthcoming year are in two parts—those based upon the assumption of the existing taxes and their rates would continue, and those based upon the proposed changes therein. A budget, in this sense, becomes both a description of the fiscal policies of the government and the financial plans corresponding to them.

It is quite possible that some revenues happen to be earmarked for certain specific expenditure heads, such as betterment levies, special assessments and the like. Similarly, some expenditure heads of the budget may be contractual in nature with the government legally bound to honour them. Examples of such expenditure heads include interest payment on loans, repayment of loans, payments arising out of satisfaction of court decrees, amounts falling due for payment on account of salaries, pensions, provident funds and so on.

Presentation in Parts

In India, a budget may be presented *in parts*. For example, each layer of the government (national and sub-national) has its own budget. In addition, there are bound to be some

intergovernmental transactions and, depending upon the legal and accounting procedures, they may form a part of the budget of one layer or the other. The net effect of the fiscal policy of any one government is conditioned by the collective budgeting of all the layers of the government. Similarly, while railway finances form a part of the central government finances, the railway budget is presented separately from the main budget of the central government.

However, with effect from 2017 the Railway Budget is merged with the Union Budget.

Periodicity

The periodicity of the public budget in India has also been a subject of debate on two counts.

- (i) In India, fiscal year runs from 1st of April to 31st March of next year. It has been a long-standing argument that the agricultural sector significantly contributes to our GDP. It has, therefore, been a long standing suggestion that the beginning of our fiscal year should coincide with the beginning of the busy season of the economy (which starts with the kharif crop) in October/November. This way the budget would cease to be a gamble in the monsoon. However, this reasoning has lost much of its weight. This is because Indian economy, on account of its (i) overall growth in the recent past, (ii) increased exposure to the global forces, and (iii) increased commercialization and diversification of agricultural sector, has gained in resiliency. Now a change in revenue receipts from agricultural sector are not able to cause a major swing in aggregate revenue receipts of the government. Public budget, for these reasons, is no longer a gamble in the monsoon.
- (ii) It is argued that the annual practice of preparation, presentation and passage of the budget is a wasteful one. Expenditure against sanctioned amounts starts with a time lag, while preparation for the next annual budget starts soon after. In other words, the budget has become a continuous and time consuming activity of the government. It is claimed that this practice allows the authorities to revise the tax structure more frequently. But this argument holds no weight. Even now the authorities are in a position to vary those taxes where such a need may arise (such as in customs duties). In respect of most other taxes, however, frequent changes do not allow a judicious assessment of the effects of tax measures. Accordingly, it is suggested that the broad features of the tax structure should be left unaltered for a few years at a time and only minor changes should be allowed from year to year. This, however, does not prevent the authorities from introducing major changes in times of national emergencies.

Secrecy

Secrecy surrounding budget proposals is also a debatable issue. It is asserted that budgetary proposals are unnecessarily kept secret till their actual presentation to the legislature. This practice causes a lot of uncertainty and speculation and obstructs efficient planning of economic activities by everyone. In India, this uncertainty affects even the State budgets because of large scale transfer of resources from the Centre to the State. Till the passage of the Central budget, the States cannot assess the size of these transfers. The State budgets are also indirectly affected by the inflationary impact of the Central budget.

NOTES

NOTES

Critics maintain that there is absolutely no reason to be secretive about proposals concerning direct taxes. Rather, they should be widely discussed to assess their impact on savings, capital formation and other parameters of the economy. An open discussion of proposals concerning even indirect taxes would cause less speculation than is the case at present. Moreover, such a discussion would enable the public to participate in the budget deliberations in a more constructive manner. For the authorities also, it would be a more flexible position as against the existing one in which they think it necessary to defend every proposal presented to the legislature. Under the new system, they will be better placed to modify the proposals to suit the needs of the economy.

4.3 REVENUE AND CAPITAL BUDGET

In many countries (including India), the budget is divided into revenue (current) and capital accounts. Revenue account covers those items which are of recurring/routine nature; while capital account covers those items which result in acquisition and disposal of capital assets and liabilities. This division can be justified on several grounds. There is an economic sense in distinguishing between expenditure that does not add to or subtract from the capital assets and that which does. And this economic sense applies with equal force to government budgeting as well. It is maintained that every economic unit must distinguish between current expenses and those incurred for acquisition of capital assets. Current expenses are equivalent to consumption; while acquisition of capital assets is not. It is only when these capital assets depreciate that real expenditure takes place in the sense of consumption. It is on this logic that private commercial units do not count the amounts spent on the acquisition of capital assets as a part of current expenses for the year. It is only the depreciation part that is so counted. It is argued that the government should also follow the same practice.

Another argument in favour of the division of the budget between capital and revenue accounts is, however, quite flimsy. It is maintained that through such a division the government can follow a good working rule, namely, ensuring that all the current expenses are met through taxation while all the capital expenses are met through borrowings. It must be noted that such a policy approach can be quite restrictive and misleading. If used judiciously, taxation, borrowing and expenditure become potent policy tools in the hands of the government. Therefore, instead of getting restricted by such self-imposed limitations, the authorities should aim at having a well orchestrated fiscal policy.

In India, the Constitution demands that the budget must distinguish expenditure on revenue account from other expenditure. Though this constitutional obligation applies only to the expenditure side of the budget, factually, this classification is applied to the receipts side as well. Moreover, the Constitution does not provide any criteria for such a classification, and no clear, objective and unambiguous criteria are available from other sources. Factually speaking, this classification is based upon established conventions and official discretion. Revenue Budget consists of the *revenue receipts*—both tax revenue and non tax revenue—and the expenditure met out of revenue receipts. The non-tax revenue receipts include revenue from currency, coinage and mint, interest receipts, dividends, profits, revenue from general services (such as police, jails, supplies and disposal, and public works), revenue from social and community services (such as education, health, housing, broadcasting, and so on), and revenue from economic services (such as agriculture and allied services, industry and mines, transport and communications).

Check Your Progress

1. Name the three parts of all government accounts.
2. What are the contents of the Indian budget?

Correspondingly, receipts on capital account, include *market loans*, borrowings from the Reserve Bank of India and others, through the sale of Treasury Bills¹ and loans from foreign governments and others to the central government. Capital disbursements include expenditure on acquisition of various physical assets like land, buildings, machinery and equipment, investments in shares and debentures, and loans to State Governments and other bodies. The Capital Budget also incorporates the transactions in the Public Account.

The division between revenue and capital accounts for the State Budgets is similar to that of the GOI budget with only some differences in terms of specific items. For example, the States receive a share of net receipts of several taxes levied and collected by GOI. They do not get any revenue from currency, coinage and mint. States also get both revenue and capital grants from GOI. While GOI can borrow from abroad, the States cannot. States borrow from GOI but do not lend to it. Their borrowings from RBI are also nearly non-existent. In recent years, investments by National Small Savings Fund in State Government securities and market borrowings have become prominent components of State borrowings.

Plan and Non-plan Accounts

This division applies only to the expenditure side of the budget and, as of now appears counterproductive. Plan expenditure covers only that portion of the total expenditure which is directed to finance the projects/schemes specifically initiated under a plan or which are the spillover of the previous plan/plans. Those projects/schemes which are completed also require maintenance and other running expenditure in future; but such expenditure is classified as Non-Plan expenditure with the result that, over time, it keeps on increasing automatically, and this is as it should be. However, the budget makers, under various compulsions, prefer to increase allocations for plan projects/schemes at the cost of non-plan allocations. As a result, existing projects/schemes remain under exploited for want of maintenance and operative allocations while new projects/schemes are taken up.

In India, till mid 1980s, in addition to the division of the budget into revenue and capital accounts, the Plan Budget was also prepared. The Plan Budget was a document which showed the budgetary provisions for important projects, programmes and schemes included in the Central Plan. It gave the details of the Budgetary support for the Central Plan by sectors of development, including the Central Plan assistance for States and Union Territories. Furthermore, extra budgetary resources for the Central Plan were also shown. The break up of the proposed outlays between General Services, Social and Community Services, and Economic Services, was shown together with various physical targets wherever possible. Currently, in pursuance of the recommendations of the Auditor and Comptroller General of India, this practice stands modified. The budget is first split up into Plan and Non-Plan portions and each part, in turn, is divided further into Revenue and Capital Accounts.

From several quarters, a suggestion has been made for the abolition of distinction between Plan and Non-Plan expenditure. However, so long as this is not done, there should be a two-fold classification, namely, (i) Revenue and Capital Accounts, each sub-classified into Plan and Non-Plan components, and (ii) Plan and Non-Plan Accounts, each sub-classified into revenue and capital components.

NOTES

NOTES

Concluding Observations

The traditional approach towards budgetary accounting is designed for an effective legislative control over the executive, and to meet the requirements of fiscal management. It is an excellent aid to government auditors and an effective check against misappropriation of funds and other fraudulent practices. To this end, therefore, accounts are classified into categories corresponding to individual ministries, departments and sections; and within each, there are further divisions and sub-divisions. But there is a lack of correspondence between the purpose and the account head. This approach does not provide information required for the formulation of fiscal policies. It does not provide a basis for assessing the effect of alternative budgetary policies and operations and for devising improvements therein. To that end, a system of economic and functional classification of the budget on the one hand and the introduction of programme and performance budgeting on the other (to be discussed in a later section) are very essential. It is noteworthy that, in India, the accounting format of the budget broadly corresponded to functional categories. But with the passage of time, the extent of this correspondence weakened and could no longer meet the requirements of a proper functional classification. and with the expansion of government activities, the older classification lost a good deal of its earlier functional relevance. For example, instead of adding new heads for them, several important items were put under the head 'miscellaneous'.

The inadequacies of the budget formats described above lead us to look for alternatives which have appeared on scene.

4.3.1 Revenue and Capital Expenditure

The Concepts. Article 112(2) of our Constitution requires that the **expenditure part** of the GOI budget must meet the following *two requirements*. (Note that no such restriction has been imposed for the receipts part of the Budget.)

First, the sums required to meet expenditure which, according to the Constitutional provisions, is 'charged' upon the Consolidated Fund of India (that is, such Constitutionally committed expenditure for which specific sanction by Parliament is not required) are to be shown separately from rest of the expenditure sums. There are seven entries which describe the 'charged' expenditure items.

Second, the Constitution says that the Budget 'shall distinguish expenditure on revenue account from other expenditure', that is, expenditure is to be classified into 'expenditure on revenue account' and 'expenditure on capital account'. In this context, the following facts are specifically noteworthy.

- The Constitution does not provide any legal or other criteria as a basis for distinction between expenditure on revenue account and expenditure on capital account.
- The budgetary classification of GOI expenditure into revenue and capital categories is based upon a combination of prevalent conventions and administrative discretion.
- The conceptual problem of this classification of receipts arises only in the case of borrowings and foreign grants, and not in the case of receipts from taxes, fees and fines and others.
- To meet the above-said Constitutional obligation, **both receipts and expenditure** sides of GOI budget are split into 'revenue account' and 'capital account' components.

Capital Account

Items representing receipts and disbursements which meet the following criteria are classified under capital account, namely, those

- (i) which add to or subtract from government's financial claims and liabilities to third parties (such as deposits, collections of small savings and other forms of loans but *not*, say, grants);
- (ii) which result in variations in *physical assets* of the government (that is, their acquisition, creation and disposal or additions, as also subtractions and alterations therein); and
- (iii) which result in variations in *financial claims* upon or liabilities to third parties.

It is clear that borrowing, lending, recovery and repayment of loans, as also remissions of loans belong to capital account of the budget.

Revenue Account

The following items belong to the revenue account of the budget, namely,

- (i) variations in *financial* balances created or owned by the Centre (such as through tax collections and their spending, receipts and payments of interest, dividends, profits, rents, fees and fines, grants, creation of currency and others),
- (ii) expenditure on upkeep and maintenance of physical assets and schemes, and
- (iii) cost of administration, police and judiciary and the like.

Broadly speaking, that **expenditure** which *does not* result in creation of physical assets of the Centre or its financial claims upon others is treated as revenue expenditure. Grants given to State Governments and other parties are also treated as revenue expenditure even when some of them may be meant for creation of assets by the recipients.

As regards defence expenditure, it can be argued that apart from current expenditure on salaries, rations and training and others of the defence personnel, expenditure incurred on acquisition of defence equipment (including items like aeroplanes, tanks and ships etc.), should also be in the revenue account. These items are expected to be 'consumed' away, with at the most junk value left at the end. Expenditure on capital account is, therefore, only that portion of the total defence expenditure which is spent for acquisition of buildings and residential accommodation.

Correspondingly, revenue receipts, while adding to its purchasing power, do not add to the financial claims upon the government. These receipts may be tax receipts, or non-tax receipts like interest receipts, grants, profits and dividends and others.

It is noteworthy that the criteria narrated above are only general indicators. They are not precise enough to provide an objective, clear-cut and unambiguous basis for classification of every transaction into revenue and capital accounts of the budget. Consequently, the authorities tend to follow prevalent conventions till there is a compelling need for deviating therefrom.

Comparative Size: Revenue receipts have always been a large component of the total receipts, but have shown an uneven variation. From four fifths of the total receipts in 1950-51, this component declined to around 56 per cent in the Third Plan, rose to 72 per cent during 1997-02, and was budgeted at 62.8 per cent in 2012-13. In contrast, expenditure on revenue account registered a fall till the Third Plan and then with a

NOTES

NOTES

secular increase was budgeted at as high as 89.2 per cent in 2008–09 and 86.3 per cent in 2012–13. Clearly this leaves very little scope for capital expenditure and developmental orientation of the GOI budget.

It is seen that revenue expenditure component dominates and far exceeds the capital expenditure one, the former registering a persistent secular uptrend since the Third Plan, and budgeted at 86.3 per cent of the total expenditure in 2012–13. This is considered an unhealthy trend for a developing country like ours where the authorities have assumed a major responsibility of promoting capital formation. Moreover, there is a persistent deficit on revenue account while, ideally speaking, a surplus should be available from it for financing a part of investment on capital account. Several explanatory factors have been mentioned above for this rapid increase in revenue expenditure. In addition, we may also mention inability of the government in checking inflationary price rise, inefficiency of public enterprises, and avoidable populist policies.

4.4 REVENUE, FISCAL AND PRIMARY DEFICIT

It is quite easy to say that a budgetary deficit is simply the excess of public expenditure over public revenue. However, in practice, the concept admits of several variations and yields widely divergent measures of budgetary deficit. There is also a good deal of confusion due to the fact that there is no standard correspondence between a selected measure and the name assigned to it. A given measure of deficit may be referred to by alternative names and similarly a given term may be used to represent alternative measures of budgetary deficit. The existence of a large number of measures is explained by the fact that each measure has an analytical and policy relevance, and there is no single measure which may be universally preferred to all others for all times to come. There is no single 'correct' measure to opt for. As the World Development Report (1989) of the World Bank says, the choice of the 'correct' measure depends upon the purpose of analysis.

Receipts and Disbursements of GOI

Before we take up alternative measures of deficit spending and illustrate them, it would be useful to present a break-up of the receipts and disbursements of GOI into relevant categories and sub-categories in an appropriate and usable form (See Table 4.1).

- I (a). This item represents Centre's share out of the tax revenue collected by it. It is therefore gross tax collection *less* states' share *less* Assignments of UT taxes to Local Bodies.
- I (b). (i) This item represents interest received on loans extended by the Centre to various parties like state Governments, Railways, P & T, Government employees, Foreign Governments, etc.
- I (b). (ii) This item includes dividends and profits, receipts in the process of performing various government duties and functions and exercising of sovereign rights, non-tax revenue of UTs without Legislature, and income from fiscal services. The last component (fiscal services) represents profit on creation of Government currency, that is, the excess of the face value of Government currency produced during the year over its cost of production.
- I (b). (iii) This item is self-explanatory. It includes grants from abroad also.

Check Your Progress

3. Mention the items which belong to the revenue account of the budget.
4. State the difference between revenue account and capital account.

II(a). This item represents repayment of loans to the Centre by its debtors. It, however, does not include recoveries of:

- (i) Ways and Means Advances to states
- (ii) Loans for Agricultural Inputs
- (iii) Loans to Government servants etc.

Correspondingly, therefore, all estimates of deficits (except that on Revenue Account) are affected by this omission.

II(b) and II(c): These components represent all varieties of borrowing by GOI except those through the sale of 91-day *ad hoc* treasury bills (borrowings through treasury bills of other kinds are included in item II(b)). These borrowings are *net* amounts, that is, gross borrowings minus repayments by the GOI on its outstanding loans. For this reason, the portion 'Securities Issued to International Financial Institutions' (these securities are deposited with RBI by the Centre) gets totally omitted because it represents simultaneous capital receipts and disbursements of equivalent amounts.

II(d): This represents sales proceeds of some assets sold by the Centre. More specifically, this came into existence on account of disinvestment of some equity share holdings in PSUs in the wake of new policy of liberalization. The reader should note the claim of the Centre that the sale of these assets reduces its budgetary deficit by an equivalent amount. Many analysts and the World Bank do not agree with this view. However, the viewpoint of the Government can be defended by pointing out that additions to Government assets through its capital expenditure, and through extending loans to other parties, are not deducted from its total expenditure in estimating Fiscal Deficit or Primary Deficit. So why should the *sale* of assets be treated differently? In other words, payments on capital account are taken to add to a deficit while the acquisition of assets is not taken to reduce it. Extending this reasoning to sale of assets, it follows that their sale proceeds should mean a reduction in a deficit, while the corresponding loss of assets should be ignored.

The remaining items in Table 4.1 are self-explanatory. It only needs reiteration that repayments of loans by GOI do not appear in 'Expenditure on Capital Account' because the 'Borrowings' in capital receipts have already been reduced to 'net' of repayment figures. However, it should be noted that 'Recoveries' of loans [Item II(a)] from the debtors of GOI are included in item II (Capital Receipts). For this reason, item V(a) [that is, 'Loans and Advances' in Expenditure on Capital Account] includes *gross* (and *not net*) amounts of loans extended by GOI to other parties (such as Foreign Governments, State Governments, and Government employees, etc.).

Concepts of Deficit

The following break-up of GOI budget enables us to define (and therefore estimate) a few concepts of deficit, namely:

- Deficit on Revenue Account (RD)
- Deficit on Capital Account (CD)
- Budgetary Deficit (BD)
- Fiscal Deficit (or Gross Fiscal Deficit) (FD) or (GFD)
- Net Fiscal Deficit (NFD)
- Primary Deficit (PD) or (GPD)
- Net Primary Deficit (NPD)

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1. Deficit on Revenue Account (RD)

The excess of expenditure on revenue account over receipts on revenue account measures revenue deficit.

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Item IV – Item I

Table 4.1 Alternative Measures of Deficit

	(₹ in crores)					
	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
1	2	3	4	5	6	7
I. Revenue Receipts	4,34,387	5,41,864	5,40,259	5,72,811	7,83,833	7,89,892
(a) Tax Revenue (net)	3,51,182	4,39,547	4,43,319	4,56,536	5,63,685	6,64,457
(b) Non-tax Revenue	83,205	1,02,317	96,940	1,16,275	2,20,149	1,25,435
(i) Interest	22,524	21,060	20,717	21,756	19,728	19,578
(ii) Non-interest	58,151	78,534	73,429	91,378	1,97,665	1,03,684
(iii) Grants	2,530	2,723	2,794	3,141	2,756	2,173
II. Capital Receipts	1,44,482	1,97,978	2,99,863	4,53,063	4,47,743	4,47,836
(a) Recoveries	5,893	5,100	6,139	8,613	9,001	15,920
(b) Borrowings, other than 91-day <i>ad hoc</i> Tr. Bills	1,24,096	1,33,678	2,51,384	4,38,774	4,05,459	3,90,782
(c) Other Capital Receipts (net)	13,959	20,405	41,774	-18,905	10,539	1,134
(d) Sale of Public Assets	534	38,795	566	24,581	22,744	40,000
III. Total Receipts	5,78,869	7,39,842	8,39,935	10,25,883	12,30,576	12,37,728
IV. Expenditure on Revenue A/c	5,14,609	5,94,433	7,93,798	9,11,809	10,53,678	10,97,162
(a) Interest Payments	1,50,272	1,71,030	1,92,204	2,13,093	2,40,757	2,67,988
(b) Non-interest Expenditure	3,64,337	4,23,403	6,01,594	6,98,716	8,12,921	8,29,175
V. Expenditure on Capital A/c	68,778	1,18,238	90,158	1,12,678	1,62,898	1,60,567
(a) Loans and Advances	8,542	-1,220	12,663	16,116	42,515	28,640
(b) Capital Outlay	60,236	1,19,458	77,495	96,562	1,20,383	1,31,927
VI. Total Expenditure	5,83,387	7,12,671	8,83,956	10,24,487	12,16,576	12,57,729
VII. Borrowings through 91-day <i>Ad hoc</i> T. Bills and Drawing Down of Cash Balances	4,517	-27,171	43,834	-1,386	-15,000	20,000
1. Revenue Deficit (IV - I)	80,222	52,569	2,53,539	3,38,998	2,69,844	3,07,270
2. Deficit on Capital A/c (V - II)	(-75,704)	(-79,740)	(-2,09,705)	(-3,40,385)	(-2,84,845)	(-2,87,269)
3. Budgetary Deficit (VI - III) = VII - (row 1 + row 2)	4,517	(-27,171)	43,834	(-1,386)	-15,000	20,000
4. Fiscal Deficit [VI - (I + II(a) + II(d)) = II(b) + II(c) + VII]	1,42,572	1,26,912	3,36,992	4,18,483	4,00,998	4,11,916
5. Net Fiscal Deficit [FD - V(a)]	1,34,030	1,28,132	3,24,329	4,02,367	3,58,483	3,83,276
6. Primary Deficit (a) FD - IV(a) + I(b)(i)	14,824	23,058	1,65,505	2,27,146	1,79,969	1,63,508
(b) FD - IV(a)	-7,700	-44,118	1,44,788	2,05,390	1,60,241	1,43,936
7. Net Primary Deficit [PD - V(a)] (a) FD - IV(a) + I(b)(i) - V(a)	6,282	21,838	1,52,842	2,11,030	1,37,454	1,34,866
(b) FD - IV(a) - V(a)	-1,62,420	-42,898	1,32,125	1,89,274	1,17,726	1,15,296

Receipts on revenue account include both tax and non-tax revenue as also grants. Tax revenue is net of states' share as also net of 'Assignment of UT Taxes to Local Bodies'. Note that receipts of UT taxes normally exceed the assignments, and the excess forms part of the receipts on revenue account. Non-tax revenue includes interest receipts, dividends and profits, and non-tax revenue receipts of UTs. Grants include grants from abroad also.

Expenditure on revenue account includes both Plan and Non-Plan components. Thus, the Plan component includes Central Plan and central assistance for State and UT

Plans. Non-Plan expenditure includes interest payments, defence expenditure on revenue account, subsidies, debt relief to farmers, postal deficit, police, pensions, other general services, social services, economic services, non-Plan revenue grants to States and UTs, expenditure of UTs without legislature and grants to foreign governments.

2. Deficit on Capital Account (CD)

The excess of capital disbursements over capital receipts measures the capital deficit. Plan capital disbursements include those on Central Plan and assistance for State and UT plans. Non-Plan capital disbursements include defence expenditure on capital account; other non-Plan capital outlay; loans to public enterprises, states and UT Governments, foreign governments and others; and non-Plan capital expenditure of UTs without legislature. The item of capital receipts has already been discussed above. It would be recalled that this item includes 'recoveries' of loans extended by the Centre itself, but only 'net' receipts of loans raised by it.

Note that receipts on account of sale of 91-day *ad hoc* treasury bills and drawing down of cash balances do **not** form a part of capital receipts. However, net receipts on account of sale of remaining varieties of treasury bills and sales proceeds of government assets are included in capital receipts.

3. Budgetary Deficit (BD)

It is the sum total of RD and CD. From Table 4.1,

$$BD = (IV - I) + (V - II) = (IV + V) - (I + II) = VI - III$$

It should be noted that in economic literature, and to a certain extent by international institutions, the term budgetary deficit is used to represent 'fiscal deficit' (FD) discussed below. FD is a wider concept while BD, as used in Indian official documents, is a narrower concept.

What is the justification for having a definition of BD which is at variance with its internationally accepted version? Officially, this justification is derived from the argument that budgetary deficit should not measure just a transfer of purchasing power from the private to the public sector. Instead, it should measure a net addition in 'high-powered money' (H) which, in turn, causes an increase in aggregate purchasing power in the hands of the economy. It should, therefore, reflect the expected effect of government expenditure in the form of an aggregate demand and inflationary pressure in the country. However, the measure of BD, as adopted in India, does not meet this criterion. It is because borrowings taken from RBI (except through the sale of 91-day *ad hoc* treasury bills) are excluded from it even when, in effect, such borrowings also add to the supply of money and credit in the economy.

It may be noted in passing that high-powered money is currency in the hands of the public and cash balances of banks including their balances with the RBI.

4. Fiscal Deficit (FD)

Fiscal deficit may also be called Gross Fiscal Deficit (GFD). It measures that portion of government expenditure which is financed by borrowings (that is, *all borrowings including those through 91-day ad hoc treasury bills*) and drawing down of cash balances. It should be noted that in India, borrowings are net amounts (that is, gross borrowings less repayments). Similarly, loans extended by GOI are included on the expenditure side of capital account while 'recoveries' are included on the receipts side.

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Therefore, the amount of loans and advances by GOI is also reduced to a net figure. From Table 4.1,

$$\begin{aligned} \text{FD} &= [\text{VI} - \{\text{I} + \text{II(a)} + \text{II(d)}\}] \\ &= \text{II(b)} + \text{II(c)} + \text{VII} \end{aligned}$$

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In other words, FD is (Total Expenditure *less* [Revenue Receipts plus Recoveries plus Sale of Public Assets]). It is also equal to the sum of three items, namely, (i) borrowings, other than through 91-day *ad hoc* treasury bills, (ii) sale of public assets, and (iii) BD.

It is often stated that FD measures an addition to the liabilities of GOI (whether backed by acquisition of some assets or not). This, we should remember, is true only if the item 'drawing down of cash balances' is zero. Mostly, it is a small item and, therefore, by and large, the above-mentioned statement may be accepted in practical decision-making.

5. Net Fiscal Deficit (NFD)

This measure of deficit is obtained when FD is reduced by 'Loans and Advances' component [V(a) of 'Expenditure on Capital Account']. In other words, this measure considers the fact that some payments by the government are not part of 'spending away', but for acquisition of assets. However, this reasoning is not carried to its logical conclusion. While assets acquired through giving loans to others are accounted for, those acquired through 'capital outlay' [a part of item V(b)] are ignored.

6. Primary Deficit (PD)

This measure is also referred to as Gross Primary Deficit (GPD). Measures of deficit described above (except CD) include payments and receipts of interest. These transactions, however, reflect a consequence of past actions of the government, namely, loans taken and given in years prior to the one under consideration. Exclusion of interest transactions, therefore, enables us to see the way the government is *currently* conducting its financial affairs. Accordingly, PD is defined as FD *less* net interest payments, (that is, *less* interest payments *plus* interest receipts), so that

$$\begin{aligned} \text{PD} &= \text{FD} - [\text{IV(a)} - \text{I(b)(i)}] \\ &= \text{FD} - \text{IV(a)} + \text{I(b)(i)} \end{aligned} \quad (\text{a})$$

However, in GOI budgetary documents, interest receipts [item I(b)(i)] are ignored so as to get a *smaller* measure of PD.

That is,

$$\text{PD} = \text{FD} - \text{IV(a)} \quad (\text{b})$$

7. Net Primary Deficit (NPD)

This measure of deficit is obtained by subtracting 'Loans and Advances' [Item V(a)] from Net Fiscal Deficit. It is also equal to FD *less* interest payments *plus* interest receipts *less* loans and advances. Thus,

$$\text{NPD} = \text{PD} - \text{V(a)}$$

Note that corresponding to two measures of PD, we get two measures of NPD, so that

$$\text{NPD} = \text{FD} - \text{IV(a)} + \text{I(b)(i)} - \text{V(a)} \quad (\text{a})$$

and

$$\text{NPD} = \text{FD} - \text{IV(a)} - \text{V(a)} \quad (\text{b})$$

This brings us to those concepts of deficit which cannot be estimated from the information given in Table 6.1 and has to be made available by the government directly.

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8. Monetised Deficit (MD)

Monetised deficit is defined as an increase in net RBI credit to central government. The rationale for this measure of deficit flows from the inflationary impact which a budgetary deficit exerts on the economy. Our Budgetary Deficit (BD) discussed above is not able to meet this test. The Chakravarty Committee recommended that in addition to existing measure of BD (namely, borrowings through 91-day *ad hoc* treasury bills and drawing down of cash balances), it should include **all** other borrowings from the RBI by the government. Since borrowings from RBI directly add to high-powered money, therefore, this measure is termed Monetised Deficit. It is obvious that **MD is only a part of FD**. Also, it should be noted that even MD is not a perfect measure of the inflationary impact of the budget. Loans from banking sector also add to the liquidity and inflationary forces in the economy.

9. Public Sector Borrowing Requirements (PSBR)

It may be termed consolidated Public Sector Deficit, and represents net claims on (that is *net use of*) the resources of the economy by the entire public sector. It is the most comprehensive measure of deficit and covers all government entities.

In brief, $\text{PSBR} = (\text{Total Expenditure} - \text{Revenue Receipts})$ for all government entities. It also equals their (New Borrowings *less* Repayments *less* Drawing Down of Cash Balances).

Note that, here, the term 'expenditure' includes wages of public employees, expenditure on goods and services, fixed capital formation, interest on debt, transfer payments and subsidies. However, it **excludes** amortization payments on government debt and accumulation of financial assets. Similarly, revenue includes taxes, fees, fines, rates, user charges, interest on public assets, transfers, operating surplus of public enterprises and sale of public assets. It, however, excludes drawing down of cash balances.

This measure raises the problem as to which economic units should be counted as part of the government sector. Also, it is not a measure of the resource cost of the economy which includes the repercussive effects including that of inflation.

10. Structural Deficit (SD)

When the borrowing requirements of the public sector (PSBR) are adjusted (that is, reduced) for occasional or temporary measures for reducing deficit and raising resources, it is termed Structural Deficit (SD). It is a measure of deficit which is expected to persist unless *long-term corrective measures* are adopted by the authorities. For example, if the government raises resources by 'sale of government assets' and through 'amnesty schemes', PSBR should be adjusted for (reduced by) these amounts to arrive at SD.

11. Operational Deficit (OD)

PSBR adjusted (that is, reduced) for inflationary price rise gives us Operational Deficit (OD). Obviously, for arriving at OD, choice of an appropriate price index is of great relevance. However, it is very difficult to select an ideal price index. Another problem

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arises from the fact that while indirect taxes add to the revenue receipts of the government, they are also inflationary in nature. Similarly, many PSUs included in the estimation of PSBR may resort to raising of user charges. This act simultaneously adds to both the revenue of the government sector and the inflationary forces, and thereby clouds the true significance of this measure of deficit.

Tolerable Limits of Deficit Spending

Tolerable limit (or 'crucial' limit) of deficit spending is indicative of that stage beyond which its ill-effects overshadow its benefits. This limit is not an absolute figure but a level related to economic conditions of the country. This level is difficult to estimate, but it is easy to see when the deficit is sufficiently within 'safe' limits or clearly exceeding the 'tolerable' ones. Further, the 'safe' limit depends upon the way in which a deficit is financed. For example, over-reliance on domestic private borrowings is likely to push up interest rates and 'crowd out' private investment. Similarly, excessive borrowing from abroad is bound to create problems of debt servicing. These problems get aggravated if the borrowings have a short maturity and/or do not lead to additional export earnings. Debt servicing can become an important factor in accelerating the depletion of foreign exchange reserves. In the same way, an economy can absorb only a limited amount of additional money without feeding inflation, and an excessive reliance on this source of financing a deficit becomes inflationary. In this context, the concept of *Seigniorage* is also a noteworthy one. Seigniorage is the ability of the government to claim resources in return for issuing currency. It is an implicit 'inflation tax' which the holders of financial assets (including conventional money balances) pay. The real purchasing power of money balances declines. And the same thing happens with real rate of interest. The burden of outstanding government debt declines and an increase in nominal interest rate seldom compensates for it. Another ill-effect of inflation caused by deficit spending is its impact on income distribution which shifts in favour of non-fixed residual like profits.

Current thinking supports the thesis that inflation is mainly caused by deficit spending, and can be cured only through budgetary reforms. Also deficit spending is a self-feeding process. With price rise, government expenditure rises faster than its revenue and the government is forced to resort to bigger deficits.

These days, it is widely believed that a mild inflation is helpful in maintaining a high level of economic activities and employment and that moderate deficits help in sustaining the mild inflation with its beneficial spill-over effects. In contrast, it is not possible to sustain huge deficits without severely damaging the economy.

Some countries (including India through its Fiscal Responsibility and Budget Management [FRBM] Act) have adopted laws to check deficit spending. Such a course, however, often fails. Ways are found to overcome the legal hurdles when the government is not able to contain its expenditure. The net outcome of such self-imposed restraints always depends upon the political will of the government and its administrative strength. As regards India, it was expected that with the passage of the Fiscal Responsibility and Budget Management Act and rules and targets framed under it, GOI would be able to improve its fiscal health on a sustainable basis. In the meantime, revenue receipts of the Centre have also recorded a creditable increase on various counts including the expanded coverage of service tax and economic growth. It is expected to receive a further boost with the introduction of a comprehensive GST. However, the Centre has not been able to contain the growth of its revenue expenditure, and the problem of fiscal deficit is still with us.

Check Your Progress

5. What is fiscal deficit?
6. How is capital deficit measured?

4.5 COUNTER CYCLICAL FISCAL POLICY

Budgetary or fiscal policy comprises steps and measures which the government takes both on the receipts and expenditure sides of its budget, including rules, regulations and procedures relating to them. To ensure its consistency with the overall economic policy of the government, its contents should not be selected in a piecemeal and haphazard manner. This frequently poses some difficult problems because some components of the policy may be contradictory to each other. The field of fiscal policy isn't very clearly demarcated from those of monetary policy and debt management because they all make use of several common components but aim at different sets of goals. It is frequently maintained that fiscal policy should mean that segment of government's economic policy which concerns itself "with aggregate effects of government expenditures and taxation on income, production and employment". According to this limitation, the micro-level effects of various taxation and expenditure measures need not be included in fiscal policy proper. Mrs. Hicks says that "Fiscal policy is concerned with the manner in which all the different elements of public finance, while still primarily concerned with carrying out their duties (as the first duty of a tax is to raise revenue), may collectively be geared to forward the aims of the economic policy." The crux of a good and effective fiscal policy lies in keeping its ingredients like expenditure, loans, transfers, tax revenues, income from property, debt management, and the like in a proper balance so as to achieve the best possible results in terms of the desired economic objectives. Discussion of individual taxation and expenditure measures is generally left out of the field of fiscal policy. But this is done only for the sake of simplicity of analysis. Essentially, a fiscal policy is meaningless unless necessary details are filled in.

Usefulness

Usefulness of fiscal policy lies in its facilitating the achievement of socio-economic objectives of the society. But it must not be forgotten that fiscal policy is only one of the several sets of weapons in the hands of the government. It should also be emphasized that fiscal policy tries to achieve its objectives by regulating the working of market mechanism (while in contrast, some other weapons may by-pass it). The extent of its success, therefore, largely depends upon the response of market forces to various policy steps initiated by the government.

Recognition

The fact that fiscal policy can be a potent tool in the hands of the authorities came to be recognized only slowly. For decades, both official and academic thinking favoured *laissez-faire* and balanced budgets. This policy, obviously, had its own drawbacks. As Keynes pointed out, an attempt to balance the budget results in its imbalance and vice versa. The rationale and usefulness of fiscal policy came to be recognized only during 1930s and later. With the advancement of growth theory, it was also discovered that long run stability also contributes to economic development. With the popularity of planning and realization of the need for accelerating rate of capital accumulation, fiscal policy has been accorded an important role in underdeveloped countries also. There, it is directed not only to stability, but also towards promoting savings, investment and reduction in distributive inequalities and regional disparities. At the same time, on account of severe rigidities in socio-economic institutions and markets, the task of restructuring fiscal policy is far more difficult in underdeveloped countries. In such countries, there is a need to

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simultaneously direct it at several targets, which also poses additional problem of priority-mix and object-rating.

If fiscal policy of the government is so formulated that it generates additional purchasing power during depression and it contracts purchasing power during the period of expansion, it is known as '*counter-cyclical fiscal policy*'. The fiscal policy is based on the relation of public expenditure and taxes to the national income, the *GNP*. The relationship between public expenditure and *GNP* and between tax and *GNP* may be expressed in the form of the following propositions.

Public Expenditure and GNP *An increase in public expenditure raises the level of GNP. The size of increase in the GNP as a result of additional public expenditure is determined by the multiplier.* Public expenditure in the form of purchase of goods and services increases business incomes and household incomes—wage, interest, rent and business profit—which in turn increases government's tax revenue. Marginal propensity to consume being greater than zero, households spend a part of additional income on consumption, and so do the people who earn additional income due to additional consumption expenditure by the households at the first instance. The process continues and *GNP* increases at the rate of multiplier.

Taxation and GNP *Direct taxes without an equivalent public expenditure have adverse effect on GNP. Direct taxes have, therefore, a deflationary impact on the economy. Increase in taxation either due to increase in the rates of existing taxes or due to imposition of new taxes, reduces GNP. The size of decrease in GNP as a result of increase in taxation depends on the tax-multiplier.* The multiplier in case of taxation works in the reverse direction. For, taxation reduces disposable income and hence consumption expenditure cumulatively. It should be noted here that the negative multiplier will not be as high as in case of public expenditure because the payment of taxes at the first instance does not reduce *GNP* as it is only a transfer of income. *Reverse multiplier or tax-multiplier will be one less than public-expenditure multiplier, even if mpc is same in both the cases.* The implication of the expenditure multiplier being higher by one than tax-multiplier is that expenditure effect of a certain amount would more than neutralize the effect of taxation of an equal amount.

Countercyclical Fiscal Policy: Automatic and Discretionary Changes *It may be inferred from the relationship between public expenditure and GNP and between taxation and GNP that a countercyclical fiscal policy would require increase in public expenditure and reduction in taxation to fight depression, and reduction in public expenditure and increase in taxation to control inflation. In other words, fighting depression would require a deficit budgeting and controlling inflation requires surplus budgeting.*

Some of the budgetary changes are *automatic* and some are *discretionary*. The automatic budgetary adjustment takes place only when fiscal policy has built-in-flexibility. The automatic budgetary changes should follow the change in *GNP*. Built-in-flexibility in the fiscal policy implies that as *GNP* falls, both income and consumption decline. Consequently, the revenue from both direct and indirect taxes declines. Government's planned and committed expenditure remaining the same, public expenditure exceeds its revenue, and the budget automatically runs into deficit. This effect is more quick and powerful in the countries which provide unemployment allowances and other relief benefits.

When *GNP* increases, tax base expands and tax-revenue increases. Expenditure level remaining the same, the budget automatically shows surplus. The deficit and surplus

resulting from fluctuation in *GNP* work as automatic stabilizers of the economy. It is, however, generally believed that automatic stabilizers prove to be adequate and serve useful purpose only for short-term fluctuations in the economy. Automatic stabilizers prove generally inadequate to control the economic fluctuations of larger amplitude. Under such conditions, discretionary changes in budget become necessary.

The *discretionary changes* in the budget refer to the changes in the tax-structure, and in the level and pattern of public expenditure by the government on its own discretion. Discretionary changes include change in tax-rate structure, abolition of existing taxes, imposition of new taxes, increasing and decreasing the public expenditure, changing the pattern of public expenditure, etc. Discretionary changes are so designed as to arrest the inflationary and deflationary trends in the economy and to mitigate the destabilizing forces, such as increase or decrease in aggregate demand.

Problems in formulating Counter-Cyclical Fiscal Policy Formulating a counter-cyclical fiscal policy is not an easy task. It involves certain complications, which should be borne in mind while devising the tax and expenditure policy to stabilize the economy. Some complications have been pointed out by Eckstein¹⁹ as follows:

1. All expenditures do not have the same multiplier effect. For example, transfer payments by the government do not create a demand for goods and services. Some kinds of public expenditures (e.g., those on free education and hospital facilities) replace private expenditure.
2. Not all tax-changes have the same multiplier effect. For example, taxes paid by the upper income groups have lower multiplier effect than those paid by lower income groups, because of differences in their *mpc*. The multiplier effects of indirect taxes are not clearly known.
3. Deficit financing through public borrowing may reduce private investment through crowding-out effect. This kind of deficit financing reduces the multiplier effect.
4. There are practical difficulties with regard to the assessment of time-lags and accuracy of forecasts. There is uncertainty with regard to effectiveness of fiscal policy.

Fiscal Policy and Stability

The problem of stability refers to that of recurring cyclical phases of upward and downward cumulative movement in income, employment, output and prices, etc. in the economy. In an underdeveloped country, such an instability is mainly caused through pressures originating from abroad and imported through variations in imports, exports, and external resource flows. Recognition of a close relationship between price changes and the level of output and employment, particularly in developed market economies, has led some economists to claim that *economic stability should be interpreted to mean a steady non-inflationary economic expansion in output and employment coupled with a very mild rise in prices*. It is argued that a very mild inflation enables an economy to achieve a continuous expansion.

Problems of Budget Deficit in India

The general public has always been sceptical about government's discussion on budgetary spending. This is unfortunate, since deficits should arouse genuine concern, particularly as their size in some industrial countries is daunting. Yet, the absolute size of deficits is not their most alarming aspect. In fact, most countries now run much smaller deficits (as

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a ratio of GDP) than they did during wartime. Rather, the persistence of budgetary shortfalls during a long period of peace, when governments traditionally pay off debts and save for the future, should set the alarm bells ringing. Furthermore, projected increases in the cost of government programmes, as population's age and economic growth lags, give cause for further concern.

Government budget deficits (the excess of spending over revenue) in industrial countries have been growing as a per cent of GDP for the past 20 years. Large deficits emerged after the oil crisis in the mid-1970s and widened dramatically after 1980, largely the result of government overspending rather than meagre tax receipts. Government expenditures in industrial countries rose from 28 per cent of GDP in 1960 to 50 per cent in 1994. These deficits have sharply increased the public debt (the accumulated burden of yearly budget deficits), which jumped to 70 per cent of GDP in 1995 from 40 per cent in 1980, weakening government finances and draining resources from the economy. Aging population and sluggish economic growth add urgency to this worrisome trend. Governments now have little choice but to restructure their spending programmes. Before understanding the measures to reduce different deficits, we should first understand the problems of budget deficit in India.

Over the past 15 years, India's general government deficits have exceeded 5 per cent in every year except in 2007-08. After a successful consolidation between 2005 and 2008 under the Fiscal Responsibility and Budget Management Act, the deficit again widened during the global financial crisis. The Thirteenth Finance Commission laid out a consolidation plan in 2010 which aimed at reducing the deficit to 5½ per cent of GDP in five years. However, achieving this target has proved elusive. In 2012, new plans for consolidation were announced. These plans focused on lowering expenditure and on controlling the cost of India's fuel and fertilizer subsidies, but achieving long-run fiscal consolidation will be challenging.

The initial years of India's planned development strategy were characterized by a conservative fiscal policy whereby deficits were kept under control. The tax system was geared to transfer resources from the private sector to fund the large public sector driven industrialization process and also cover social welfare schemes. However, growth was anaemic and the system was prone to inefficiencies. In the 1980s, some attempts were made to reform particular sectors. But the public debt increased, as did the fiscal deficit. India's balance of payments crisis of 1991 led to economic liberalization. The reform of the tax system commenced. The fiscal deficit was brought under control. When the deficit and debt situation again threatened to go out of control in the early 2000s, fiscal discipline legalisations were instituted. The deficit was brought under control and by 2007-08 a benign macro-fiscal situation with high growth and moderate inflation prevailed. During the global financial crisis fiscal policy responded with counter-cyclical measures including tax cuts and increases in expenditures. The post-crisis recovery of the Indian economy is witnessing a correction of the fiscal policy path towards a regime of prudence. In the future, the focus would probably be on bringing in new tax reforms and better targeting of social expenditures.

After a brief impact of the global economic slowdown in 2008-09, Indian economy recovered quickly recording 8.4 per cent GDP growth in 2009-10 and 9.3 per cent GDP growth in 2010-11. The recovery, however, was short lived as growth rate slowed down substantially in the following year, 2011-12 to 6.2 per cent. Fiscal expansionary response which continued since 2008-09 to arrest the growth decline resulted in high fiscal deficits. The continued Euro Zone crisis and gloomy economic trends in major economies

contributed adversely, impacting India's exports negatively. This along with the elevated levels of crude prices and high levels of gold imports led to the widening of trade gap and current account deficit. Macroeconomic analysis of India during the years 2010-11 and 2011-12, therefore, showed a trend of rising current account deficit, sticky inflation, falling savings rates, falling investments and even consumption. The uncertainty in global economy along with the monetary policy tightening measures led to a perceptible negative impact on economic growth. As a result of these factors, the growth is estimated to come down to a decade low of 5 per cent of GDP, as per Central Statistics Office's (CSO) advance estimates. Last time sub 6 per cent growth was seen in 2002-03, when the growth in GDP was registered at 4 per cent.

The widening trade gap, falling investment and difficult economic situation, both domestically and abroad, have added to the negative outlook on the Indian economy. The rigid inflationary conditions and consequent tightening measures on monetary policy along with negative sentiment on investments and savings have had a deep impact on industrial growth. Discouraging trends in economic growth called for immediate corrective measures and appropriate policy response. Public debate centred around the fact that high fiscal deficit tends to heighten inflation, reduces room for monetary policy actions, and dampens private investment. The sustained high levels of fiscal deficit though required as a countercyclical measure to spur growth, has also caused diverse forms of macroeconomic imbalances, which could not be overlooked and immediate corrective measures were called for to contain the likely growth in fiscal deficit during 2012-13 and onwards.

Mid-year course correction with suitable policy response became imminent in the emerging scenario. Fiscal consolidation by way of regulating deficits and cutting expenditure to create positive business environment was immediate need of the hour. Government accordingly appointed Kelkar Committee in August 2012 to suggest 'Roadmap for Fiscal Consolidation' within one month's time period. Kelkar Committee held series of meetings with Ministry of Finance, concerned line ministries and Planning Commission to finalize its report within the given timeframe. Deliberating on various issues facing the economy, Kelkar committee suggested a slew of measures to contain the rising trend of fiscal deficit. The committee observed that deficit financing through domestic sources tends to be inflationary. At the same time, twin deficits hypothesis implies that, given a certain level of private savings, an increase in fiscal deficit will have to be balanced by either a reduction in private investment or an increase in the current account deficit. The Indian economy has been witnessing both these features.

The fiscal stress in the 'do-nothing' scenario as per Kelkar Committee report was fast approaching unsustainable levels. On revenue side, slower pace of economic growth implied shortfall in both direct taxes—both corporation and income tax—due to lower profits and incomes. Similarly, slower pace of economic growth meant shortfall on custom duty, being directly linked to imports and excise duty due to slower pace growth in production. Another matter of concern related to expected shortfall in non-tax revenue by at least ₹30,000 crore on account of lower realization from 2G spectrum following court litigation and poor response to auctions. It was estimated by the Committee that the revenue collections in the current year, tax and non-tax put together will take a hit by at least ₹60,000 crore from the budgeted targets in BE 2012-13. Similarly, international crude prices remained at high levels in the range of US \$ 110 to 115 per barrel peaking to above US \$ 120 per barrel for some time. As India imports bulk of its crude requirements and the pricing of petroleum products by oil marketing companies for the purpose of calculating under-recoveries are benchmarked to the international prices, there was a

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significant increase in the estimated under-recovery of Oil Marketing Companies (OMCs). In tandem with high crude price, prices of most of the petroleum products in the international market went up sharply, and fertilizer bill ballooned due to rising Urea prices. Therefore, it was estimated that the subsidy expenditure would rise by about ₹ 70,000 crore. Accordingly, it was estimated that unless immediate corrective measures are taken the deficit will be well above 6.1 per cent of GDP.

The net effect would be 'crowding-out' of private sector financing for investment due to large gross borrowing requirement. In an extremely fragile world market financing of this magnitude would be creating huge risks for macroeconomic and external stability. Against this scenario and aided by Kelkar Committee recommendations, government undertook the task of meeting the challenge. As a first credible step towards fiscal consolidation, the fiscal deficit target was revised from 5.1 per cent to 5.3 per cent for the current year. As per the roadmap of fiscal consolidation laid down by the government, the fiscal deficit in 2013-14 has been projected at 4.8 per cent, to be reduced by 0.6 per cent every year to achieve 3.0 per cent target by the end of the plan period, viz. 2016-17. In order to achieve the target for Disinvestment, committee of secretaries was constituted in the Ministry of Finance. Similarly, efforts were made to mop up revenues both tax and non-tax to contain the fiscal deficit within the projected targets. However, shortfall in the customs duty on indirect side and non-realization of targeted revenues from Spectrum sale on the Non-tax side had to be factored in.

The case of India illustrates the challenges of consolidating the fiscal position when growth is relatively strong. Fiscal vulnerabilities are masked by high growth. In the past years, the debt-to-GDP ratio has fallen as nominal output growth exceeded the pace of debt accumulation. However, several papers show that it is less costly to embark on fiscal adjustment in a supportive macroeconomic environment. Fiscal multipliers tend to be larger during downturns and fiscal consolidation would involve disproportionately higher costs (see Corsetti et al., 2010; Baum et al., 2012; Baunsgaard et al., 2013; and Blanchard and Leigh, 2013). Therefore, consolidation during good times can help, as can engaging in simultaneous structural reforms. Delaying fiscal correction may lead to an increase of risk premiums as market sentiment deteriorates. High borrowing costs can crowd out important spending and derail growth. In the near term, there is an uncertainty about the trade-off between fiscal consolidation and growth. Therefore, a crucial question is how to achieve consolidation while minimizing the negative growth effects of raising revenues or controlling spending.

Going by official statistics, the Indian economy appears to have already achieved what is globally considered an enviable position – a virtuous combination of high growth and dwindling inflation. According to estimates by the Central Statistical Office, GDP growth accelerated from 5.6 per cent in 2012-13 to 7.2 per cent in 2014-15 and further to 7.6 per cent in 2015-16. The average annual inflation rate as measured by the WPI had fallen from 7.4 per cent in 2012-13 to 2 per cent in 2014-15 and further to -2.8 per cent in 2015-16 (up to January 2016).

Indicators from the economic survey have reflected that gross fixed capital formation (investment) had fallen from 33.4 per cent of GDP in 2012-13 to 30.8 per cent in 2014-15 and further to 29.4 per cent in 2015-16.

The government has built up fiscal credibility since it came to power in 2015 and macroeconomic stabilization has yielded rich dividends. Inflation and the current account deficit are within comfort zones and foreign investors have endorsed the policies. A fiscal slippage would be seen negatively by foreign investors.

Check Your Progress

7. What were the recommendations of the Kelkar Committee in 2012 regarding fiscal consolidation?
8. What was India's GDP growth rate in 2009-10 and 2010-11?

4.6 SUMMARY

- In India, the actual financial statement of the Government of India incorporating item-wise proposed disbursements and estimated receipts for a specified period (normally a year) is termed its Budget Statement.
- In India, all Government accounts (of both the Centre and the States) are grouped into three parts, viz., (i) Consolidated Fund, (ii) Public Account and (iii) Contingency Fund.
- The Contingency Fund consists of those finances which are put at the disposal of the governments to meet unforeseen emergent expenses.
- In many countries (including India), the budget is divided into revenue (current) and capital accounts. Revenue account covers those items which are of recurring/routine nature; while capital account covers those items which result in acquisition and disposal of capital assets and liabilities.
- In India, till mid-1980s, in addition to the division of the budget into Revenue and Capital Accounts, the Plan Budget was also prepared.
- It is quite easy to say that a budgetary deficit is simply the excess of public expenditure over public revenue. However, in practice, the concept admits of several variations and yields widely divergent measures of budgetary deficit.
- As the World Development Report (1989) of the World Bank says, the choice of the 'correct' measure depends upon the purpose of analysis.
- The excess of capital disbursements over capital receipts measures the capital deficit. Plan capital disbursements include those on Central Plan and assistance for state and UT plans.
- Monetised deficit is defined as an increase in net RBI credit to Central government. The rationale for this measure of deficit flows from the inflationary impact which a budgetary deficit exerts on the economy.
- Tolerable limit (or 'crucial' limit) of deficit spending is indicative of that stage beyond which its ill-effects overshadow its benefits. This limit is not an absolute figure but a level related to economic conditions of the country.
- Government budget deficits (the excess of spending over revenue) in industrial countries have been growing as a per cent of GDP for the past 20 years.

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4.7 KEY TERMS

- **Monetised deficit:** It implies the increase in the net RBI credit to the central government, such that the monetary needs of the government could be met easily.
- **Structural deficit:** It is an estimate of how large the fiscal deficit would be if the economy was operating at a normal, sustainable level of employment.
- **Seigniorage:** It is the ability of the government to claim resources in return for issuing currency. It is an implicit 'inflation tax' which the holders of financial assets (including conventional money balances) pay.

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4.8 ANSWERS TO 'CHECK YOUR PROGRESS'

1. All government accounts are grouped into three parts namely, (i) Consolidated Fund (ii) Public Account (iii) Contingency Fund.
2. In India, a budget (whether central or State) shows financial accounts of the previous year, the budget and revised estimates of the current year, and the budget estimates for the forthcoming year.
3. The items which belong to the revenue account of the budget are as follows:
 - (i) Variations in *financial* balances created or owned by the Centre (such as through tax collections and their spending, receipts and payments of interest, dividends, profits, rents, fees and fines, grants, creation of currency, etc.).
 - (ii) Expenditure on upkeep and maintenance of physical assets and schemes, and
 - (iii) Cost of administration, police and judiciary and the like.
4. Revenue account covers those items which are of recurring/routine nature; while capital account covers those items which result in acquisition and disposal of capital assets and liabilities.
5. Fiscal deficit may also be called Gross Fiscal Deficit (GFD). It measures that portion of government expenditure which is financed by borrowings (that is, *all borrowings including those through 91-day ad hoc treasury bills*) and drawing down of cash balances.
6. The excess of capital disbursements over capital receipts measures the capital deficit.
7. The Kelkar Committee in August 2012 suggested 'Roadmap for Fiscal Consolidation' within one month's time period. Kelkar committee suggested a slew of measures to contain the rising trend of fiscal deficit. The committee observed that deficit financing through domestic sources tends to be inflationary.
8. India's GDP growth in 2009-10 was 8.4 per cent and 9.3 per cent in 2010-11.

4.9 QUESTIONS AND EXERCISES**Short-Answer Questions**

1. What is a budget statement?
2. Write a short note on the periodicity of the public budget.
3. Prepare short notes on the following:
 - (a) Budgetary deficit (b) Primary deficit

Long-Answer Questions

1. Why is it necessary to distinguish expenditure on revenue account from other expenditure? Give reasons for your answer.
2. Discuss the 'receipts and expenditure sides' of the Government of India budget.
3. Critically analyse the problem of budget deficit in India.

4.10 FURTHER READING

- Tyagi, B.P. 1975. *Public Finance*. Meerut: Jai Prakash Nath and Co.
- Sundaram and Sundaram. 1984. *Public Finance*. New Delhi: Sultan Chand & Sons.
- Croxton, Frederick Emory, Dudley Johnstone Cowden and Sidney Klein. 1967. *Applied General Statistics*. New Jersey: Prentice-Hall.
- Gupta, S. C. and V. K. Kapoor. 1996. *Fundamentals of Applied Statistics*. New Delhi: Sultan Chand & Sons.

Endnotes

1. Borrowings from the Reserve Bank of India through the sale of long-term securities are considered a part of the 'market loans'.

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UNIT 5 PUBLIC DEBT

Structure

- 5.0 Introduction
- 5.1 Unit Objectives
- 5.2 Differences between Private and Public Debt
- 5.3 Sources of Public Debt
- 5.4 Effects of Government Borrowing
 - 5.4.1 Effects of Government Borrowing on Price Level and Aggregate Demand
- 5.5 Summary
- 5.6 Key Terms
- 5.7 Answers to 'Check Your Progress'
- 5.8 Questions and Exercises
- 5.9 Further Reading

NOTES

5.0 INTRODUCTION

In the 18th and 19th centuries, the government, under the influence of laissez-faire philosophy, which was reflected in economic liberalism, restricted its activities to its minimum unavoidable essential duties of providing protection and security to the citizens. Consequently, the activities of the state were limited to performing only the essential functions of protecting the community against external aggressions and internal disorders by spending on the defence and maintenance of law and order. These functions were considered essential for the preservation of the community.

However, with the passage of time, with an enormous increase in the responsibilities of the state and also with the development of enlightened views on public finance, the governments in order to supplement their traditional financial resources started borrowing from individuals and institutions within the country and also from outside the country.

Although borrowing as a source of financing certain government activities has not been unknown in the developed countries, the necessity of the public borrowing by the government is imperative in the case of less developed countries where the taxable capacity of the people is low. In modern times, public debt is as popular in the developed countries as it is in the less developed countries.

In modern times, borrowing by the government has become a normal method of government finance along with other sources of public finance like taxes, fees and so forth. In all countries of the world, public debt has shown the tendency of increasing rapidly. In fact, the debt burden, particularly external debt burden, of the world's less developed countries has grown phenomenally and quite disproportionately to the debt servicing capacity of these poor countries. At present, the external debt burden of the third world countries has crossed the staggering figure of over \$2,000 billion mark and in the case of several individual developing countries of Latin America and Africa; the annual debt servicing burden of payment exceeds or nearly equals their total export earnings. For such unfortunate countries, there is little hope that in any foreseeable future they will be in a position to pay off their foreign debt. In fact, the external debt burden of the Third World countries has been mounting up year after year adding to the grave economic plight of these poor countries. These countries are in the never-ending external debt trap from which these countries find it almost impossible to come out. With each passing year, world's developing countries are sliding deeper in debt.

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We find a significant difference in the composition of debt of the developed and developing countries. For example, the total public borrowings of the less developed countries may generally comprise the borrowings made from abroad while in a developed country these mainly consist of the borrowings raised internally from the local authorities, institutions and individuals. It is on account of this significant difference in the composition of public debt that the American economists, including Taylor, have emphasized the internal debt for their country. In India, however, the economists emphasize the external debt. However, both internal debt and external debt are the essential and important components of public debt. In this unit, you will get acquainted with the differences between private and public debt, sources of public debt and effects of government borrowing.

5.1 UNIT OBJECTIVES

After going through this unit, you will be able to:

- Differentiate between private and public debt
- State the sources of public debt
- Analyse the effects of government borrowing

5.2 DIFFERENCES BETWEEN PRIVATE AND PUBLIC DEBT

The government of a country finances its expenditure from its income. The income of the government consists of what is called public revenue and public debt. In its wider sense, the term 'public revenue' includes all kinds of income. Consequently, it includes also the money that a government borrows. The amount borrowed by the government during any given year constitutes the income of that year. However, since debt has to be repaid to the creditors from whom it is borrowed, it does not constitute the income of the government from the point of view of the long period. Thus, the main difference between the two is that public revenue consists of the money revenue or income which the government is not obliged to return to the people from whom it is obtained while public debt carries with it the obligation on the part of the government to repay the loan amount together with interest to the creditors from whom it has been borrowed.

Thus, in a broad sense, public debt may be called 'revenue' of the state. Just as the taxes levied and collected in any given year constitute the income of the government, in the same way, loans raised or debt incurred and received in that year also constitute the income of the government of that year. However, the vital difference between the public debt and the other traditional sources of public revenue (taxes and fees) is that while the former has to be repaid with interest, the latter are not. Taxes are collected from the public without any promise or commitment on the part of the government to provide the taxpayers any service, much less the commitment of paying them back to the taxpayers, but public loans or debt are taken by the government from the banks, institutions and individuals on the explicit understanding given in writing that these shall be repaid on maturity while interest shall be paid regularly, half-yearly or yearly as stipulated in the loan agreement.

The necessity of repaying the loans and various consequences of the different methods of redeeming a loan necessitate a separate study of the subject of public debt.

Differences between Private Debt and Public Debt

In the matter of public borrowing, the government is placed in almost a similar position as is a private borrower. The relationship between the government and the holders of the government bonds is the same as that between a private borrower and a private lender. The government is barely a government in all its characteristics in such transactions. Like a private borrower, the government may also borrow either for unproductive consumption or for investment purposes. The government will also have to pay interest on such borrowings. However, the dissimilarities between the two kinds of debt are quite glaring. The following are the main differences between private and public debt:

- In times of emergency, like war or economic crisis, the State may force the people and/or institutions in the country to lend funds to it. No private individual or institution can, however, force or compel the other private individuals or institutions to lend.
- In the abnormal circumstances, the State can repudiate the payment of loans taken by it from the public while the private individual can under no circumstance refuse payment of loans to another private individual without inviting legal action. However, normally the State will only in very rare and exceptional circumstances take resort to repudiation of loan because such an act on its part will damage its prestige beyond repair.
- Public debt is generally spent for productive purposes whereas private debt may be spent both for productive as well as for unproductive purposes.
- The State usually repays public debt by taxing the people. The creditors also make their contribution to the extent they also pay taxes in this task of repayment of public debt. In other words, the burden of public debt is also borne by the creditors of the government. As against this, the burden of private debt is never borne by the creditors. In other words, we can say that a private person has to repay his/her debt either out of personal earnings or out of his/her accumulated assets or by borrowing from other sources. While the government can at least partially shift the burden of payment of public debt on the shoulders of the individual creditors in the country in the case of internally held debt.
- The State can unilaterally reduce the rate of interest payable on public loans but a private economic unit is not in a position to do so. Private borrowers have to pay the rate of interest which they have contracted to pay to the lenders.
- The government may take loans from the public for a very long period while a private person can get loans only for a relatively short period of time. In fact, the public debt may consist of government bonds which have infinite or no maturity period.
- The government may borrow both from the internal and external sources. In other words, it not only borrows from others; technically it can also borrow from itself. When the government covers the budget deficit through the printing of paper notes, it amounts to taking loans from itself. However, a private person can borrow only from external sources.

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- The proceeds of public debt are generally spent to promote the welfare of the society, including the creditors. For instance, when the government spends the loan proceeds on development schemes, it benefits almost all the sections of the community. Even the creditors are also benefited through this developmental expenditure. On the other hand, the private debt is not spent in the interest of creditors because it is exclusively spent to finance the individual or private project.
- Being large in amount, public debt significantly affects the production and distribution of wealth and income in the country while a private debt, being small in amount, produces no such effects.
- Since the credit of the government is generally high, it can borrow at lower interest rates than is possible for the private individuals. We can trust a government more easily than a private individual because the government loan is perfectly credit-risk free.

Causes for the Increase in Public Debt

The size of public debt has increased tremendously in modern times. There is hardly any government today which has not contracted loans both from abroad and in the country from its people. Following are the important causes for the extraordinary increase in public debt in modern times.

1. Abandonment of the laissez-faire, laissez-passer policy: Modern governments have abandoned the policy of laissez-faire according to which they indulged in the minimum amount of economic activities in the community. The 19th century philosophy was that the government which governed the least and consequently spent the least was the best. Nowadays, governments actively participate in the economic affairs according to the requirements of the people. The present-day state is a welfare state. Consequently, it resorts to economic planning under which it undertakes the execution of several development projects in order to raise the living standards of people. In order to implement the economic plans it has to borrow funds frequently on a large scale from the public.

Thus, government takes recourse to public debt for development purposes. Even the governments in advanced countries have to undertake mass scale construction of public works like roads, railways, irrigation works, power-houses and so forth, for accelerating the economic growth of their countries. The less developed countries interested in the optimum utilization of their economic resources find public debt a very useful device to finance the various development projects.

2. Unpopularity of taxation: People generally do not like to pay taxes to the government. Taxation, whether old or new, has always been unpopular with the public. The citizens generally oppose the imposition of new taxes and enhancement of the old rates of taxation. To get over this public opposition, the government adopts the easier method of resorting to public debt.

3. Facing natural calamities: Sometimes, the government raises loans in order to face natural calamities, such as, floods, famines, earthquakes and other calamities. For example, in 2017, the North-East states—Assam, Arunachal Pradesh, Manipur and Nagaland were severely affected by floods. Prime Minister Narendra Modi announced a package of ₹ 2,350 crore for all North-East states for mitigating the impact of floods on short- and long-term basis. Such cases of natural calamities lead to a sudden spurt in the government expenditure. Thus, the government

would be committed to incur a much larger expenditure and would, therefore, run into a sizeable public debt.

4. **Waging of wars:** When a country is engaged in war, it has to borrow heavily from the public. Modern warfare is so costly that the normal income of the State raised through taxation falls substantially short of the actual war expenditure. Besides, taxation beyond certain limits has disastrous consequences on production, and, thus, interferes with the most important objective during a war, namely, the winning of war. Moreover, a public loan is a better and easier method of collecting revenue than taxation. Governments, therefore, borrow extensively from individuals and institutions toward war financing.
5. **Covering of temporary budget deficit:** Sometimes, the government does not consider it appropriate to meet its budget deficit by resorting to additional taxation. In such a situation, the government resorts to temporary borrowing from public.
6. **Fighting the depression:** During the great depression of the 1930s, the long-practised traditional monetary techniques of raising the economy from the depth of depression failed. Fiscal policy was then devised as a way out to deal with the problem. Depression does not mean that the public has no money to spend. Money is there but due to lack of entrepreneurship, the money remains unutilized. Profit expectations being low, nobody is willing to invest his money. At such a juncture, the government can utilize this money by raising borrowings from the public and utilize these borrowings on its own to raise the level of aggregate effective demand in the economy. On the other hand, the private enterprise may be willing but not able to enhance production and thereby to raise output and employment due to lack of funds. At such times, the government may borrow from the banks and release the borrowed funds often supplementing the private enterprise. Either by ensuring circulation of new money or by activating the idle resources in the economy by raising loans, the government may be able to lift the depressed economy and place it on the road to recovery and lead to prosperity.
7. **Controlling inflation:** By raising public debt, the government can withdraw a large amount of money from the public and prevent prices from rising. Since the monetary policy of the central bank alone has not been very successful, fiscal policy of which the public debt constitutes an important part, has been attaining greater importance ever since World War I.
8. **Financing economic development:** An underdeveloped country is always faced with the shortage of funds. Taxation is resented if it is heavily imposed on the people because the taxable capacity of the people is low. However, the need for finance is imperative in order to take the economy out of the vicious circle of poverty. In such a situation, public loans are the only way out for the government.

Classification of Public Debt

Public loans differ from one another in many aspects. These differences are due to either the markets in which the loans are floated, the rate of interest offered on the government bonds, the conditions of repayment or the purpose for which they are used. Thus, public debt can be classified into various categories. For example, we may have internal and external loans, funded and unfunded loans, redeemable and irredeemable loans, productive and unproductive loans. In the past, loans of some governments have also been compulsory but loans of modern governments are voluntary. In times of emergency, the modern governments encourage and sometimes bring moral pressure on

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the people of their countries to subscribe for public loans (government bonds). However, direct compulsion is hardly ever brought to bear on the people in present times. The main classification of public debt can be discussed as follows:

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1. Productive and unproductive public debt: Public debt is incurred for various purposes. Sometimes, a government borrows money in order to construct a railway line or a canal. Sometimes, money is borrowed for purposes of famine relief and sometimes, it is borrowed to wipe off a deficit in the government budget. It will be seen, therefore, that in some cases, the borrowed money is spent to produce goods or services that can be sold for a price. A railway line, for instance, is a profitable commercial proposition. While some railways do not pay, but many do pay. If the debt is incurred by the government for the purpose of constructing a railway line that pays, it would be called a productive debt. The same applies to a loan raised to finance the construction of an irrigation canal if it is able to pay for itself.

However, the public debt incurred to wipe-off the budget deficit or to help provide employment to people in the famine stricken areas and to supply people with food is not a productive debt. Thus, the word 'productive' here has been used in the businessman's sense. In simple words, we can say that productive debt is that debt whose proceeds are spent by the government directly for productive purposes. The spending of such a debt after some time on the completion of the project on which the borrowed money has been spent increases the revenue of the government out of which the government can pay the interest on this debt. Thus, productive loans add to the total productive capacity of the country. As against this, an unproductive debt is a debt wherein the proceeds are not spent directly for productive purposes. Such loans do not add directly to the productive capacity of the country. Consequently, it becomes increasingly difficult to repay such unproductive loans. It is on this account that this debt (unproductive) is often known as a 'dead-weight debt'.

2. Voluntary and forced public debt: Voluntary debt is taken from the people on a voluntary basis without coercing the people. Ordinarily, public debt is a voluntary debt. However, sometimes the government may take loans from the public even against their wishes. For example, at the time of grave national crisis like war, the government may go to the extent of raising forced loans from the public. In India, the introduction of a compulsory deposit scheme is an example of this forced kind of public loans. Consequently, loans given to the government by the people on their own accord are called voluntary debt, whereas compulsory debt comprises those loans which are taken by the government by coercing the people by virtue of its sovereign powers.

In most cases, the debt incurred by the government is voluntary and no loan is taken against the will of the lenders. However, in emergency when the people do not buy government bonds due to lack of faith in the stability of government, the government may make it compulsory for the people to lend to it a specified amount by forcing the people to buy the government bonds. Such loans (for example, war bonds) are termed as forced loans.

3. Internal and external public debt: The government of a country can go to any national and/or international capital market and borrow funds from there. Internal debt is contracted by the government from the individuals and institutions within the country. On the contrary, external debt is taken by the government from the

individuals, institutions and/or governments of foreign countries. For instance, under the British rule, the government of India used to take (i) rupee loans which were taken by the government from the people of the country, and (ii) sterling loans which were raised in the London money market. At present, the government of India has profusely borrowed from international financial institutions like the World Bank, the International Development Association, friendly foreign governments and from international capital markets.

There is a general feeling that an internal debt is better than an external debt. Many people denounce the resort to external loans on the part of the government on political grounds by arguing that a foreign loan may carry with it foreign control of the country's economy. The main objection to an external loan seems to be based on the misconception that it involves a drain of wealth from the country. When loans are taken from the foreigners, the country has to pay annually a heavy sum of money by way of payment of interest on these loans. This results in the remittance of huge funds to foreign countries. Consequently, a large chunk of country's limited foreign exchange earnings from exports become non-available for the country's economic development. Moreover, an external debt can also pose a danger to the economic and political independence of the country. On the other hand, if we borrow money in the home market, there is no drain of the scarce national resources and the wealth remains in the country.

A country cannot, however, be rendered bankrupt by an internally held debt because it only causes the redistribution of wealth within the country while an external debt, if not used productively with care, may cause great hardship to the nation by increasing her debt burden beyond her debt repaying capacity. For example, for most of world's underdeveloped countries, the external debt servicing burden absorbs a major part of their total foreign exchange earnings through their limited exports. Among the top twenty developing debtor countries, India's external debt stock to Gross National Income (GNI) at 23.4 per cent was the fifth lowest and in terms of the foreign exchange cover for external debt, India's position was the sixth highest at 69.7 per cent in 2015.

- 4. Funded and unfunded public debt:** Funded debt is that public debt for the payment of which the government establishes a separate fund which is called the sinking fund. Every year the government credits a certain amount of money to this fund. On maturity, the debt is repaid out of this particular fund.

As against this, an unfunded public debt is a debt for the repayment of which the government creates no separate fund. The interest on this debt is paid by the government out of its ordinary income. The principal amount is repaid by the government by contracting additional loans from the market. It is on this account that a funded debt is sometimes also referred to as a floating debt or a long-term debt whereas an unfunded debt is called a short-term debt. Unfunded debt is generally paid off within a year. Treasury bills are an example of unfunded debt because these are generally for a period of three or six months and are never for a period longer than a year.

Unfunded debts are incurred for purposes of financing the temporary deficit gap in the budget. Although the public revenue may be equal to public expenditure, but it may be that due to mismatching of the income and expenditure in the first half of the year the expenditure is greater than the revenue while in the second half the revenue is greater than the expenditure. In such a case, the government would have to borrow some money temporarily during the first six months as this debt can easily be repaid during the second

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half of the year out of the budget surplus. Such borrowings are, therefore, always in anticipation of public earnings.

5. Redeemable and irredeemable public debt: Redeemable public debt refers to that debt, the principal amount of which is repaid by the government after a predetermined period of time. The government regularly pays interest on this debt. On the expiry of the maturity period of the debt, the government pays the principal amount to the lenders. It is on this account that it is known as a redeemable debt. In order to repay this loan, the government establishes a sinking fund and credits a fixed amount of money every year to this fund. On the expiry of the debt period, the principal amount is repaid out of this sinking fund. Public loans are mostly redeemable on maturity.

As against this, a non-redeemable public debt is that debt, the principal amount of which is never returned by the government, although the government continues to pay interest on it permanently. The British Consols issued in 1750 by Prime Minister Henry Pelham's government is an example of such an irredeemable public debt.

The difference between the two kinds of loans is that when a loan is redeemable, the government has to make some arrangement for its repayment and funds have to be obtained for the loan to be repaid. It may be decided to repay it from tax-money and that is, in most cases, the best thing to do. For this purpose, either the old tax rates have to be enhanced and/or fresh taxes have to be imposed on people. In other words, there may be deepening and/or broadening of the tax structure. Which particular tax is better depends on a variety of considerations.

Certainly, it is not wise to go on borrowing without paying off the debt little by little because such a policy would plunge the government in heavy and an ever-growing burden of public debt. Moreover, the interest burden on public loans goes on mounting and the taxpayers will have to pay heavily in the end. Consequently, the redeemable debt is preferable to the irredeemable one because of its convenient method of payment.

5.3 SOURCES OF PUBLIC DEBT

There are two important sources of public borrowings, viz., internal sources and external sources. Internally, the government may borrow funds from individuals, charitable trusts, financial institutions, commercial banks and other financial intermediaries and the central bank in the country. Externally, the government may borrow from individuals, international financial institutions and foreign governments. We shall discuss the important sources of public borrowing in the following manner. It may be mentioned at the outset that the exact effects of public borrowing will depend to a large extent on the sources of the borrowed funds.

1. Borrowing from individuals: If individuals purchase government bonds, some adjustment in their consumption pattern or in the use of their accumulated savings must occur. When government bonds are sold to individuals, there will be very little direct curtailment either of consumption or business investment. The government bonds will be bought largely from funds that would have been used to buy other securities and perhaps in part from idle cash balances. The diversion from other securities may indirectly have some contradictory effects which will be considered after the review of the other sources of funds since the effect is common to all of them. The net benefit here is that although individually people possess a very small amount to be spent on any small project but the government may use the entire collected amount successfully in building a big project.

Check Your Progress

1. What constitutes revenue of the state?
2. Define external public debt.

- 2. Borrowing from non-banking financial institutions:** Another source of government borrowing is the borrowing from non-banking financial institutions. When the non-banking financial institutions such as insurance companies, investment trusts, mutual savings banks, chit funds, and others buy government bonds, they reduce their surplus cash balances by making investment in the government bonds. These institutions prefer to invest their funds in government bonds on account of these bonds being perfectly free from credit-risk and also due to their high negotiability and liquidity. The rate of interest paid on government bonds is, however, relatively low. Consequently, in many cases, financial institutions prefer to invest in the high-risk high-return giving securities, particularly in the equity shares of companies under the management of known and experienced industrialists. When the non-banking financial institutions purchase the government bonds, they do so in order to reduce their cash holdings.
- 3. Borrowing from commercial banks:** Both the individuals and the non-banking financial institutions purchase government bonds out of their own cash funds. The commercial banks can do so by creating additional purchasing power. The commercial banking system can make additional loans up to an amount determined by the credit multiplier which is determined by their excess cash reserves and the required cash reserve ratio. The credit creation is made possible by the fact that money given as loan by a bank is typically added to the accounts of the borrowers and is paid to people who have accounts with other banks.
- 4. Borrowing from the central bank:** The central bank of the country subscribes, at times substantially, to government loans by supporting these loans in the money and capital markets. This action creates the purchasing power in the same manner as the commercial banks do. By purchasing government bonds, the central bank credits the account of the government. The latter pays to its creditors by drawing cheques on its account maintained with the central bank. Those bond-holders who receive the cheques from the government deposit these cheques with their banks. As a consequence, these banks find themselves with large reserves which become the basis for additional loans and advances.
- 5. Borrowings from external sources:** Apart from borrowing from different individual and institutional sources in the country, the government may also borrow from other countries. These borrowings can be used to finance war expenditure or to buy the much-needed defence equipment or to pay for the import of capital goods required for the various development projects and so forth. In recent years, the two important external sources of government borrowings are first, international financial institutions like the International Monetary Fund, the World Bank Group and the International Finance Corporation. These financial institutions provide loans to the member countries both for short-term, for overcoming the temporary balance of payments difficulties and also for long-term, for development purposes. The second external source of borrowing is the government assistance from friendly nations which is generally received for development projects. In modern times, for the less developed countries, like India, external sources of government borrowings have become considerably important. India received a loan of \$3.8 billion in 2015 from the World bank comprising the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA).

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Check Your Progress

3. Name the internal sources of public borrowing.
4. Mention the two important external sources of public borrowing.

5.4 EFFECTS OF GOVERNMENT BORROWING

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Following the well-known German economist Adolph Wagner, economists have argued that the government should use its tax income in order to finance its current expenditure and it should take recourse to borrowing from the public only in order to finance its capital expenditure. In modern times, it is commonly accepted that taxation and borrowing can be used for either type of expenditure depending upon the circumstances. In case of less developed countries, both taxation and borrowing are used to finance development projects. The economic effects of government expenditure financed by public borrowing are basically different from the effects of similar expenditure financed by taxation in the following two important aspects:

- Taxation curtails the wealth of the taxpayers while loans do not reduce the wealth of the lenders but merely change its form.
- In taxation, the funds are transferred from the public to the government compulsorily while in the case of borrowing such a transfer of funds is voluntary.

The uniqueness of public debt lies in the fact that it has its 'revenue effects' as well as its 'expenditure effects'. In the first place, the raising of money by means of a loan makes the people change their budgets. Although it may not directly reduce the consumption expenditure as taxation does because it is not out of the current incomes but out of savings generally that the public loans are purchased by the people but it is certain that the raising of money affects the overall expenditure, consumption and capital expenditure. Thus, as its first effect, public debt affects the overall expenditure of people in the country.

Secondly, the benefits conferred on the people by the expenditure of money raised by public loans, have another kind of effects on the economy. These benefits of the loan need not always be different from those that are conferred on the public by spending the money raised by taxes provided that the borrowed money is used for the same purposes as the money raised by taxes is used.

1. Effects on Consumption and Investment

Government borrowing should not normally result in the curtailment of consumption because lending to the government, being voluntary, will be mostly met out of savings and not through reduction in consumption expenditure; only in case of war-time borrowing programme, substantial pressure is applied on the individuals to reduce their consumption in order to buy government bonds. Otherwise, the possible direct adverse effect on consumption is that which may result from special advantages of the new government bonds or the higher interest rates as these might offer some inducement to individuals to save more out of their given income by curtailing their current consumption.

There is greater possibility of adverse effect of public debt on investment. We know that the sale of bonds to the commercial banks having excess cash reserves increases the purchasing power through credit creation. Consequently, it should not curtail investment. On the other hand, the sale of government bonds to individuals reduces the funds which they have for expansion of their own business. There will be no contradictory effect if the bonds are sold to the central bank, to the commercial banks if they have excess cash reserves which they utilize to purchase the bonds, or to the individual lenders who purchase them out of surplus funds.

Apart from these effects, there is one direct effect. The growth of public debt may give rise to the fear of increased taxes in future. The profitability of investment running over a long period of years will appear to be less if it is felt by the people that the government borrowing will result in higher taxes in future.

2. Effects on the National Income

Since under usual circumstances, the borrowing of funds will have little contractionary effect on the economy, the net effect of a programme of government expenditure financed by borrowing is almost certain to be expansionary. The extent of the expansionary effect will be greater than that arising out of the financing of the same expenditure by taxation. Borrowing will have almost no adverse effect on consumption and no great adverse effect on investment. In contrast, any programme of taxation is certain to have considerable contractionary effect. If government bonds are sold to the central bank, and the commercial banks increase loans on the basis of their larger cash reserves, the borrowing itself, as well as the expenditure of the borrowed funds, will have an expansionary effect on the economy. The only instance in which the overall effect of public borrowing is likely to be contractionary is that in which the borrowing creates great fear about future financial stability of the government.

3. Effects on the Distribution of Income

A programme of government expenditure financed by borrowing increases the real income of those people who benefit from the expenditure without currently reducing the purchase of the bonds (except through price increases with full employment). If the government expenditure is meant to provide greater economic welfare to the lower income groups, the result will be a reduction in the inequalities and a more equal distribution of income between people. However, to the extent the loan finance becomes inflationary some of the favourable effects on the distribution of income may be neutralized.

Another point to be considered here is the payment of interest on the bonds. Interest payment represents a transfer of real income from the taxpayers to the bondholders because the government will have to tax the people so as to pay to the bondholders the interest and later the principal amount as well. If the bond-holders and the taxpayers are identical persons, there will be no net redistribution of income. This will, however, be possible only in a very rare situation. Consequently, some redistribution of income will take place so long as the taxpayers and the bond-holders belong to the different income groups in the community.

4. Effects on the Allocation of Resources

The public debt, in itself has little effect on resource allocation and, therefore, on the composition of national product. However, to the extent that public debt curtails business investment activity in the economy, the output of capital goods compared with the total output will be less. Furthermore, the decline in investment will not be equal in all the industries, being greater in some industries than in the others. The allocation of resources is not affected by the method of financing.

5.4.1 Effects of Government Borrowing on Price Level and Aggregate Demand

It is claimed that most public borrowings *from the market* only divert funds into the hands of the government. As a result, there is no net addition in aggregate demand and, hence no increased pressures on prices. This reasoning is quite misleading because it

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tries to hide some basic facts.

Firstly, even if public debt does not add to aggregate demand, it is bound to be inflationary because the economy's productive resources get diverted from the production of consumption goods into that of capital goods. By their very nature, investment goods industries have longer gestation periods and therefore during the intervening period, the demand for consumption goods tends to exceed their supply.

Secondly, borrowings used for war activities, for meeting natural calamities and for other relief measures are most likely to be inflationary in their impact because they are basically consumption-oriented.

Thirdly, when a government borrows from the central bank, there is an addition in money supply which in turn adds to demand and pushes up prices.

Fourthly, holding of public debt by commercial banks can also lead to an addition in demand and inflationary pressures. Banks rate government securities as highly liquid which can be encashed at any time with minimum risk of capital loss. This assured liquidity position, therefore, tempts them to increase their loans and advances and thus add to the inflationary pressures in the market.

However, if public debt is used to bring about an increase in productivity of the economy leading to an increased supply of the demanded goods, inflationary forces would be checked to that extent. In addition, the authorities may resort to price controls, rationing and other measures to keep prices under control.

5.5 SUMMARY

- The government of a country finances its expenditure from its income. The income of the government consists of what is called public revenue and public debt.
- In a broad sense, public debt may be called 'revenue' of the state. Just as the taxes levied and collected in any given year constitute the income of the government, in the same way loans raised or debt incurred and received in that year also constitute the income of the government of that year.
- In the matter of public borrowing, the government is placed in almost a similar position as is a private borrower. The relationship between the government and the holders of the government bonds is the same as that between a private borrower and a private lender.
- The size of public debt has increased tremendously in modern times. There is hardly any government today which has not contracted loans both from abroad and in the country from its people.
- People generally do not like to pay taxes to the government. Taxation, whether old or new, has always been unpopular with the public. The citizens generally oppose the imposition of new taxes and enhancement of the old rates of taxation.
- Public loans differ from one another in many aspects. These differences are due to either the markets in which the loans are floated, the rate of interest offered on the government bonds, the conditions of repayment or the purpose for which they are used.
- Public debt is incurred for various purposes. Sometimes, a government borrows money in order to construct a railway line or a canal. Sometimes money is borrowed for purposes of famine relief and sometimes it is borrowed to wipe out a deficit in the government budget.

Check Your Progress

5. What is the effect of government borrowing on the allocation of resources?
6. What is the difference in the economic effects between government expenditure financed by public borrowing and similar expenditure financed by taxation?

- Voluntary debt is taken from the people on a voluntary basis without coercing the people. Ordinarily, public debt is a voluntary debt.
- Unfunded debts are incurred for purposes of financing the temporary deficit gap in the budget. Although the public revenue may be equal to public expenditure, but it may be that due to mismatching of the income and expenditure in the first half of the year the expenditure is greater than the revenue while in the second half the revenue is greater than the expenditure.
- Redeemable public debt refers to that debt, the principal amount of which is repaid by the government after a predetermined period of time. The government regularly pays interest on this debt.
- There are two important sources of public borrowings, viz., internal sources and external sources.
- Following the well-known German economist Adolph Wagner, economists have argued that the government should use its tax income in order to finance its current expenditure and it should take recourse to borrowing from the public only in order to finance its capital expenditure.
- Government borrowing should not normally result in the curtailment of consumption because lending to the government, being voluntary, will be mostly met out of savings and not through reduction in consumption expenditure; only in case of war-time borrowing programme, substantial pressure is applied on the individuals to reduce their consumption in order to buy government bonds.
- A programme of government expenditure financed by borrowing increases the real income of those people who benefit from the expenditure without currently reducing the purchase of the bonds (except through price increases with full employment).

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5.6 KEY TERMS

- **Public debt:** It refers to a part of the total borrowings by the Union Government which includes such items as market loans, special bearer bonds, treasury bills and special loans and securities issued by the Reserve Bank. It also includes the outstanding external debt.
- **Monetary policy:** It is the macroeconomic policy laid down by the central bank. It involves management of money supply and interest rate and is the demand side economic policy used by the government of a country to achieve macroeconomic objectives like inflation, consumption, growth and liquidity.
- **Sinking fund:** It is a fund made up of sums of money set aside at intervals, usually invested at interest, in order to meet a specified future obligation.

5.7 ANSWERS TO 'CHECK YOUR PROGRESS'

1. The taxes levied and collected in any given year constitute the revenue of the government; in the same way, loans raised or debt incurred and received in that year also constitute the revenue of the government of that year.
2. External debt is taken by the government from the individuals, institutions and/or governments of foreign countries.

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3. Internally, the government may borrow funds from individuals, charitable trusts, financial institutions, commercial banks and other financial intermediaries and the central bank in the country.
4. The two important external sources of public borrowing are the following:
 - International financial institutions like the International Monetary Fund, the World Bank Group and the International Finance Corporation.
 - The government assistance from friendly nations which is generally received for development projects.
5. The public debt, in itself has little effect on resource allocation and, therefore, on the composition of the national product. However, to the extent that public debt curtails business investment activity in the economy, the output of capital goods compared with the total output will be less.
6. The economic effects of government expenditure financed by public borrowing are basically different from the effects of similar expenditure financed by taxation in the following two important aspects:
 - Taxation curtails the wealth of the taxpayers while loans do not reduce the wealth of the lenders but merely change its form.
 - In taxation, the funds are transferred from the public to the government compulsorily while in the case of borrowing; such a transfer of funds is voluntary.

5.8 QUESTIONS AND EXERCISES

Short-Answer Questions

1. What are the causes for the increase in public debt?
2. Write short notes on the following:
(a) Redeemable debt (b) Productive debt
3. Write a short note on the effect of government borrowing on the price level.

Long-Answer Questions

1. Differentiate between private debt and public debt.
2. Discuss the classification of public debt.
3. Critically analyse the effects of government borrowing.

5.9 FURTHER READING

- Tyagi, B.P. 1975. *Public Finance*. Meerut: Jai Prakash Nath and Co.
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UNIT 6 STATISTICS

Structure

- 6.0 Introduction
- 6.1 Unit Objectives
- 6.2 Primary and Secondary Sources of Data
- 6.3 collection and Tabulation of Data
 - 6.3.1 Types of Tables
- 6.4 Measures of Central Tendency
- 6.5 Measures of Dispersion
 - 6.5.1 Range
 - 6.5.2 Mean Deviation
 - 6.5.3 Standard Deviation
- 6.6 Summary
- 6.7 Key Terms
- 6.8 Answers to 'Check Your Progress'
- 6.9 Questions and Exercises
- 6.10 Further Reading

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6.0 INTRODUCTION

In this unit, you will study about primary and secondary sources of data, collection and tabulation of data, measures of central tendency and dispersion. The most important object of calculating and measuring central tendency is to determine a 'single figure' which may be used to represent a whole series involving magnitudes of the same variable. You will also learn about arithmetic mean, median and mode. Finally, you will also learn about weighted arithmetic mean, geometric mean and harmonic mean. Measures of dispersion refer to statistics that signify the extent of the scatteredness of items around a measure of central tendency.

6.1 UNIT OBJECTIVES

After going through this unit, you will be able to:

- Explain the primary and secondary sources of data
- Discuss tabulation of data
- Interpret the measures of central tendency
- Identify the measures of dispersion

6.2 PRIMARY AND SECONDARY SOURCES OF DATA

Primary data is the information collected during the course of an experiment in experimental research. It can also be obtained through observation or through direct communication with the person associated with the selected subject by conducting surveys and interviews. There are several methods of collecting primary data. Some of these are as follows:

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- Observation
- Interviews
- Questionnaires
- Schedules
- Surveys

Observation Method

Observation is the most common method of studying behavioural sciences. It is not a scientific method, but it becomes a scientific tool when used for formulating the purpose of a research. In this method, the information collected by the researcher is totally based on his observation. If the researcher is studying different brands of shoes, he will not ask the person wearing the shoes of that particular brand. Rather, he will observe it himself and then come to some conclusion.

Firstly, the main advantage of this method is that there are no chances of partiality if the observation is done accurately. Second, the information or the data collected through observation is related to what is currently happening and is not affected by past behaviour or future intentions. Third, this method is independent of a person's willingness to respond and does not require much cooperation on the part of the person, as it happens to be the case in the interview or questionnaire methods. The observation method is suitable in those situations where the respondent is not capable, for some reason, of expressing the feelings verbally.

In the observation method, researchers must keep in mind the following points:

- What should be observed?
- How should the observation be recorded?
- How can the accuracy of observation be ensured?

Types of Observation Methods

Observation methods can be categorized into different types depending on various factors such as style for recording observed information, data needed for observation and activity of the observer. The different types of observation methods are as follows:

- **Structured observation:** It is an observation method in which the following points need to be considered:
 - o Careful definition of the matter that needs to be observed.
 - o Identification of the style that must be used to record the observed information.
 - o Standardization of the condition of observation.
 - o Selection of the data required for observation.

- **Unstructured observation:** It is an observation method in which a definition of the matter to be observed, the style to be recorded, standardized conditions of observation and selection of the required data of observation are not known to the researcher. This method is most appropriate where an explored study of the matter under observation is required.

- **Participant observation:** It is an observation method in which the observer is a member of the group he is observing, in order to understand the needs and the problems faced by the group better. For example, a team leader observes all his team members and does the same work as his team members. There are several advantages of participant observation, which are stated as follows:

- o The researcher is able to record the natural behaviour of the group.
- o The researcher can even gather information, which could not easily be obtained if he observes in a disinterested fashion.
- o The researcher can even verify the truth of the statements made by the informants in the context of the questionnaires or a schedule.
- **Non-participant observation:** It is an observation method in which the observer is not a member of the group under observation. This method has a disadvantage—the observer is unable to understand what the team members are feeling.
- **Disguised observation:** It is an observation method in which the members of the group are unaware of the fact that they are being observed.
- **Controlled observation:** Observation that takes place according to definite pre-arranged plans, involving experimental procedures is called controlled observation.
- **Uncontrolled observation:** Observation that takes place in a natural setting is called uncontrolled observation. The main aim of this method is to have spontaneous picture of the situation and for this the prime requirement is sufficient time.

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Limitations of Observation Method

Though the observation method provides different ways of studying behavioural science, there are some limitations in using these methods. These limitations are as follows:

- An observation method is generally expensive.
- It provides very limited information on the observed matter.
- It may be affected by some unwanted factors; for example, people who are not involved in direct observation might create problems while collecting data through the observation method.

Interview Method

An interview is a method of collecting data that involves presentation of oral and verbal stimuli and the reply is in oral and verbal responses. The most common method of interview is personal interview.

Personal Interview

A personal interview involves two persons, i.e., the interviewer and the interviewee. The interviewer is the person who questions the interviewee. There is a face-to-face discussion between them. There can be more than one interviewer while taking a personal interview. There are two types of interviews: direct personal interview and indirect oral interview.

In a direct personal interview, the interviewer collects information from the concerned sources. He should be present at the site from where the data has to be collected. This method is most appropriate for intensive investigations, but this method may not be suitable in situations where a direct contact with the concerned person is not possible. In such cases, an indirect oral examination or investigation takes place where the interviewer cross-examines the interviewee to check his knowledge about the problem under investigation. The information exchanged between the interviewee and the interviewer is recorded for future reference.

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A personal interview can be of the following types:

- **Structured interview:** If the personal interview takes place in a structured way, it is called a structured interview. In this type of personal interview, the set of questions to be asked is predefined and the techniques used to record the information are highly standardized. Structured interviews are economical, as they do not require much information from the interviewer and are used as the main technique to collect information for descriptive research studies. The following are samples of structured interview questions:
 - o What is the main function of your production department?
 - o Why do we need to check an order for clearing a product when they have already been cleared for production?
- **Unstructured interview:** If the personal interview takes place in an unstructured way, it means that the questions to be asked to the interviewee are decided at the time of interview. In this type of personal interview, the set of questions to be asked is not predetermined and there no standardized techniques are used. A list of additional questions is provided to the interviewer and it depends on him to ask them or not. This method demands deep knowledge and greater skills of the interviewer. You can use an unstructured interview as the main technique to collect information in the explorative manner and formulate research studies. The following are samples of unstructured interview questions:
 - o How would you evaluate the benefits of new machinery that is installed in your production department?
 - o If you are provided with a choice, how would you have designed the present production department?

Surveys Method

A survey is a scientific process of acquiring data and opinion from the public. Researchers undertake surveys in order to determine the opinion of the public regarding products, candidates and other topics; for example, a sample of voters is surveyed before an election to determine how the public perceives the candidates and their issues. A manufacturer makes a survey of the potential market before introducing a new product. The information acquired from the public is used to develop new products, improve services and for various other purposes. Thus, a survey is an important key to improve or maintain the quality of life.

The process of conducting a survey is a complex task. In order to conduct a survey, a large number of skilled and trained persons is required. There are many ways in which data for a survey can be collected, such as by phone, mail and the Internet.

The principle focus of a survey is on the design and collection of data in which many intricacies involved are frequently overlooked. However, a researcher, while conducting a survey, also gives attention to the need for proper evaluation of data, data as well as its proper analysis. A researcher collects the information or data by means of standardized questions so that every individual surveyed responds to exactly the same questions. The results of the surveys are presented in the form of summaries such as statistical tables and charts.

Those who conduct a survey are typically large organizations, government agencies and institutions who know that listening carefully to the consumers is important for their success. Researchers cannot divulge the name of the client for whom they are undertaking the survey because if the respondents get to know the name of the organization, it may

create a bias in their responses. Researchers only reveal the name of the organizations as and when they are directed to do so.

Other Methods

There are some other methods that are also used for data collection. These are as follows:

- **Warranty cards:** These are cards that dealers use for collecting information regarding their products. The information required is printed in the form of questions on the warranty cards, which are placed inside the package along with the product. The consumer is requested to fill the card and post it back to the dealer.
- **Distributor or store audits:** Distributors and manufactures, through their salesmen, conduct distributor or store audits at regular intervals. Retailers also get their stores audited by salesmen and use the information to estimate the market size, market share, seasonal purchasing pattern and so on. The data is not by questioning, but by observation; for example, while doing an audit for grocery, a sample of stores is visited periodically and data is recorded on inventories either by observation or by copying the data from store records. The advantage of this method is that it offers the most efficient way to evaluate the effect of different techniques on sales.
- **Pantry audits:** Pantry audit is used to estimate the consumption of goods at the consumer level. In this type of audit, the researcher collects information, such as list of different products, quantities of each product and the prices of each product consumed. All this data is recorded by observing the consumer's pantry. The main objective of a pantry audit is to determine which brand and type of product is being used by which category of consumer, assuming that the contents of the pantry accurately signify their favourites. Pantry audits do not require a series of operations; only one visit is enough to determine the actual preferences of the consumers. An important drawback of pantry audits is that it is not possible to determine the actual preferences of consumers only from the audit data.
- **Consumer panels:** A consumer panel is an extension of the pantry audit. In this technique, the daily record of a set of consumers is maintained to obtain information about consumer preferences. Later, these records are provided to the officers investigating the consumer preferences. Alternatively, you can say that a consumer panel includes a sample of consumers who are interviewed over a fixed interval of time. Consumer panels are of two types:
 - **Transitory consumer panel:** A transitory consumer panel is set up in order to determine the influence of a particular phenomenon. A transitory consumer panel is performed on a before-and-after basis. This means that the panel examines the consumer response before and after implementing a particular phenomenon. In this technique, the initial interview of the consumers is conducted before implementing the phenomenon. A second round of interview is conducted after that phenomenon has occurred, to determine the changes in consumer attitude, if any. Such panels are mostly used in advertising and social research.
 - **Continuing consumer panel:** A continuing consumer panel is set up for an indefinite period of time to obtain data about certain aspects of the attitude of consumers over a particular period of time. This panel acts as a general-purpose panel to help investigators on different subjects. Such panels are

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mostly used in the areas of consumer expenditure, public opinion, radio and TV listenership.

- **Use of mechanical devices:** Mechanical devices are extensively used to obtain information related to consumers. The devices used for collecting information are as follows:
 - **Eye camera:** These are used to collect information about the focus of the respondents on a specific portion of a sketch or diagram or written material. The information collected with the help of eye cameras is used to design advertising material.
 - **Pupilometric camera:** These are used to record the dilation of pupils because of a visual stimulus. The extent of dilation of pupils helps determine the amount of interest produced by the stimulus.
 - **Psychogalvanometer:** It is used to measure the degree of body excitement aroused by a visual stimulus.
 - **Motion picture camera:** It is used to record the body movements language of a buyer when he/she decides whether to buy a particular product from a shop or a big store.
- **Projective techniques:** These are also known as direct interviewing techniques. These techniques were developed by psychologists to collect data about the primary reason, desire or intention of respondents by using projections. In a projective technique, while providing information about a particular topic, the respondent automatically projects his/her own attitude or feelings on that subject. The projective technique is mostly used in inspirational research and in attitude surveys. Some of the important projective techniques are as follows:
 - **Word association test:** It is a test that provides information regarding words that have maximum correlation.
 - **Sentence completion test:** It is an extension of the word association test. In this technique, the informant is asked to complete a sentence in order to determine the perception of the informant about a topic.
 - **Story completion test:** It is a technique where the informant is given a story to help focus on the given subject and then asked to give the conclusion for the story.
 - **Verbal projection test:** It is a technique where the informant is asked to give a comment or an explanation on a particular topic.
 - **Play technique:** It is the technique where the informants are given a situation and are asked to perform for improving the situation. For this, the informants are given various roles.
 - **Quizzes, tests and examinations:** It is a technique that helps in extracting information regarding specific ability of the candidates on various subjects.
 - **Sociometry:** It is the technique that describes social relationships among individuals in a group.
- **Depth interview:** These interviews are designed to determine the underlying reason and desire of the consumer. This technique is most commonly used in inspirational research. In a depth interview, the interviewer needs to explore the hidden needs, desires and feelings of the respondents, so it is necessary for the interviewer to be a skilled one. Therefore, the researchers and interviewers must

be given proper training before they start the work. This is not an easy task and takes a great deal of time.

A depth interview can either be projective or non-projective. Projective interviews involve indirect questions that are not very closely related to the subject under study, whereas in non-projective interviews, the interview questions are subject-specific. Non-projective interviews are sufficient enough to provide details about the psycho-social behaviour of consumers.

- **Content analysis:** This is a data collection technique that involves analysis of documentary materials, such as books, magazines, newspapers and the contents of all the verbal materials.

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Secondary Data: Collection Methods and Instruments

Secondary data is the data which has already been collected and examined earlier by other investigators. While making use of the secondary data, the investigator has to first determine the sources from where the secondary data can be obtained. In this method, the researcher is not at all aware of the problems related to how the data was originally collected. The secondary data can either be published data or unpublished data. Published data is available mostly from the following sources:

- Publications of the central, state or local governments.
- Publications of foreign governments.
- Technical and trade journals.
- Books, magazines and newspapers.
- Reports prepared by research scholars, universities and economists.
- Public records, statistics and historical documents.

The sources of unpublished data include diaries, letters, unpublished biographies and autobiographies. While making use of secondary data, researchers must carefully examine the available data to decide whether the data is suitable for the subject under study or not. The characteristics that a researcher must ensure in the secondary data before using it are stated as follows:

- **Reliability of data:** The secondary data available on a particular subject must be reliable. The reliability of secondary data can be determined by obtaining answers to the following questions:
 - o Who collected the data?
 - o What were the data sources?
 - o Was the data collected using proper methods?
 - o At what time was it collected?
 - o Was there any bias on the part of the compiler?
 - o What was the level of accuracy desired?
 - o Was the desired level of accuracy achieved?
- **Suitability of data:** The secondary data available on a particular subject must be suitable for that subject. The data suitable for one subject may not be suitable for another. Therefore, the researcher should properly examine the available data and verify the definitions of different terms and the units of data collection before using that data.

- **Adequacy of data:** The secondary data available should be adequate in terms of accuracy. If the accuracy level of the available data is lower than what is required, the data is considered inadequate.

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Selection of Appropriate Method for Data Collection

Various methods are available for a researcher to use the collection of data on a particular subject. The factors that a researcher must consider for selection of the appropriate method for data collection are as follows:

- **Nature, scope and object of enquiry:** This is an important factor that must be considered while selecting the data collection method. The selected data collection method should suit the type of enquiry to be performed by the researcher. This factor helps determine whether the data available is sufficient or some other information is required to be collected.
- **Availability of funds:** Availability of funds also determines the data collection method to be used. If the researcher is provided with only a limited amount of funds, then he will be bound to select a comparatively cheaper method, which may or may not be as effective and efficient as some expensive methods.
- **Time factor:** The amount of time available for a particular research project should also be considered while selecting the data collection method. Some methods take relatively greater amount of time as compared to the others. Therefore, the researcher must select the method that suits the time limitations of the project.
- **Precision required:** The precision level required for a particular project also determines the method that should be selected for data collection.

Case Study Method

The case study method is the most common method of collecting secondary data. It is mainly used for the purpose of qualitative analysis. It involves a thorough and complete examination of a social unit. A social unit can either be a person, a family, an institution, a cultural group or even the entire community. A case study involves in-depth study of a particular subject. The case study method emphasizes on the complete investigation of only restricted number of events related to a subject and the relationship between the different events. The main objective of a case study is to determine the factors that are responsible for the behaviour patterns of the given unit in totality.

In the words of the eminent researcher H. Odum, 'The case study method is a technique by which individual factor, whether it be an individual or just an episode in the life of an individual or a group, is analysed in its relationship to any other in the group'. Thus, a fairly exhaustive study of a person or group is known as life or case study. Burgess has used the words, the 'Social Microscope' for the 'Case Study' method. Another researcher, Pauline V. Young, has defined the concept of case study as a 'Comprehensive study of a social unit of a person, a group, a social institution, a district, or a community'. In short, case study is a method that involves qualitative analysis of an individual or a situation or an institution.

Characteristics of the Case Study Method

The following are certain characteristics of the case study method:

- In this method, the researcher is allowed to take one or more than one social unit for study. Instead of a social unit, the researcher can also select a situation for study.

- This method involves intensive study of the selected unit. As each unit is studied for its minute details, the study takes a long period of time. This helps ensure the correctness of the information collected about a particular unit.
- This method helps determine the complex factors of a particular unit.
- It also helps determine the integrity of the selected unit with the other units.
- This method follows the qualitative approach rather than the quantitative approach.
- In the case study method, efforts are made to determine the mutual interrelationship of the causal factors.

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Evolution and Scope of the Case Study Method

In the field of Sociology, the case study method is an extensively used research technique. Frederic Le Play introduced this method in the field of social investigation. Herbert Spencer was the first to make use of case materials in his comparative study of different cultures. This method is also used by anthropologists, historians, novelists and dramatists to solve their problems related to their areas of interest. Even management experts use this method to obtain clues of certain management problems. Conclusively, the case study method is used in different disciplines.

Major Phases of the Case Study Method

The major phases involved in the case study method are as follows:

- Identification and resolution of the status of the phenomenon or the unit to be examined.
- Accumulation of data and selection of the phenomenon.
- Investigation of the history of the selected phenomenon.
- Analysis and recognition of informal factors related to the selected phenomenon.
- Application of corrective measures.
- Review of programme to identify the effectiveness of the treatment applied.

Advantages of the Case Study Method

Some of the important advantages of the case study method are as follows:

- As the case study method involves exhaustive study of a particular unit, the complete behaviour pattern of the concerned unit is understood. According to Charles Horton Cooley, case study deepens our perception and gives us a clearer insight into life. It gets at behaviour directly and not by an indirect and abstract approach.
- With the help of a case study, a researcher can obtain genuine and progressive record of personal experiences.
- It helps a researcher determine the natural history of the selected unit. It also helps determine the relationship of the selected unit with the social factors of the surrounding environment.
- It also helps frame relevant hypotheses along with the data, which may be helpful in testing them.
- It helps obtain in-depth knowledge of a particular subject, which is possible neither with the help of the observation method nor with the help of the schedule method.

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- The researcher is allowed to use one or more than one method under this method, depending upon the situation. Alternatively, the use of different methods, such as depth interviews, questionnaires, documents, study reports of individuals and letters is possible in case of case study.
- It helps determine the nature of the selected unit along with the nature of the universe.
- It helps increase the experience of the researcher, which in turn enhances his/her analysing ability and skills.
- It enables the researcher to observe social changes.
- It helps obtain conclusions and maintain continuity in the research process.
- It helps obtain data necessary for taking decisions on some management problems.

Limitations of the Case Study Method

Some of the important limitations of this method are as follows:

- The situations of case study are mostly incomparable.
- According to Read Bain, case data is significant data as it does not provide any knowledge of the impersonal, universal, non-ethical, non-practical and repetitive aspects of a phenomenon.
- There are always some chances of false generalization because there are no specific rules of data collection.
- It is a time-taking technique and requires a lot of expenditure.
- It is based on certain assumptions which may not be true in some cases. This decreases the usefulness of the case data collected for a particular social unit.
- It can be used only in a limited geographic area.

6.3 COLLECTION AND TABULATION OF DATA

Tabulation is another way of summarizing and presenting the given data in a systematic form in rows and columns. Such presentation facilitates comparisons by bringing related information close to each other and helps in further statistical analysis and interpretation.

Parts of a Table

1. **Table number:** A table should be numbered for easy identification and reference in future. The table number may be given either in the centre or side of the table but above the top of the title of the table. If the number of columns in a table is large, then these can also be numbered so that easy reference to these is possible.
2. **Title of the table:** Each table must have a brief, self-explanatory, and complete title which can
 - (a) indicate the *nature* of data contained.
 - (b) explain the *locality* (i.e., geographical or physical) of data covered.
 - (c) indicate the *time* (or period) of data obtained.
 - (d) contain the *source* of the data to indicate the authority for the data, as a means of verification and as a reference. The source is always placed below the table.

Check Your Progress

1. List the various methods of collecting primary data.
2. What is secondary data?
3. Name the most common method of collecting secondary data.

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3. **Caption and stubs:** The headings for columns and rows are called caption and stub, respectively. They must be clear and concise.
4. **Body:** The body of the table should contain the numerical information. The numerical information is arranged according to the descriptions given for each column and row.
5. **Prefactory or head note:** If needed, a prefactory note is given just below the title for its further description in a prominent type. It is usually enclosed in brackets and is about the unit of measurement.
6. **Footnotes:** Anything written below the table is called a footnote. It is written to further clarify either the title captions or stubs. For example, if the data described in the table pertain to profits earned by a company, then the footnote may define whether it is profit before tax or after tax. There are various ways of identifying footnotes:
 - (a) Numbering footnotes consecutively with small number 1, 2, 3, ..., or letters a, b, c, ..., or star *, **, ...
 - (b) Sometimes symbols like @ or \$ are also used to identify footnotes.

A blank model table is given as follows:

Table Number and Title [Head or Prefactory Note (if any)]

<i>Stub</i>	<i>Caption</i>				<i>Total (Rows)</i>
	<i>Subhead</i>		<i>Subhead</i>		
	<i>Column-head</i>	<i>Column-head</i>	<i>Column-head</i>	<i>Column-head</i>	
<i>Stub Entries</i>					
					<i>Total (Columns)</i>
	Footnote :				
	Source Note :				

6.3.1 Types of Tables

The classification of tables depends on various aspects: objectives and scope of investigation, nature of data (primary or secondary) for investigation, extent of data coverage, and so on. The different types of tables used in statistical investigations are as follows:

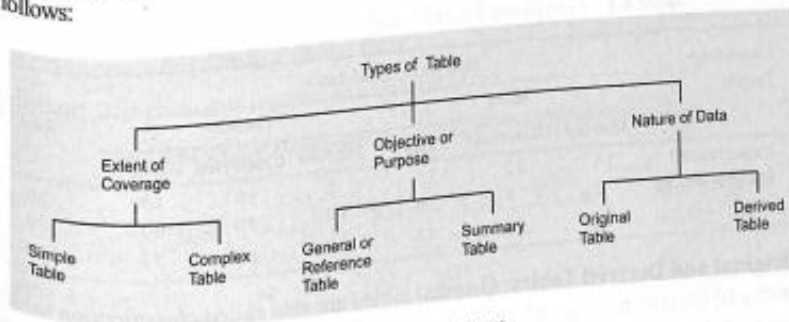


Fig. 6.1 Types of Table

Simple and Complex Tables: In a *simple table* (also known as one-way table), data are presented based on only one characteristic. Table 6.1 illustrates the concept.

Table 6.1 Candidates Interviewed for Employment in a Company

Candidate's Profile	Number of Candidates
Experienced	50
Inexperienced	70
Total	120

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In a *complex table* (also known as a manifold table) data are presented according to two or more characteristics simultaneously. The complex tables are two-way or three-way tables according to whether two or three characteristics are presented simultaneously.

1. **Double or Two-Way Table:** In such a table, the variable under study is further subdivided into two groups according to two inter-related characteristics. For example, if the total number of candidates given in Table 6.1 are further divided according to their sex, the table would become a two-way table because it would reveal information about two characteristics, namely male and female. The new shape of the table is shown in Table 6.2.

Table 6.2 Candidates Interviewed for Employment in a Company

Candidates Profile	Number of Candidates		Total
	Males	Females	
Experienced	35	15	50
Inexperienced	10	60	70
Total	45	75	120

2. **Three-Way Table:** In such a table, the variable under study is divided according to three interrelated characteristics. For example, if the total number of male and female candidates given in Table 6.2 are further divided according to the marital status, the table would become a three-way. The new shape of the table is shown in Table 6.2.
3. **Manifold (or Higher Order) Table:** Such tables provide information about a large number of inter-related characteristics in the data set. For example, if the data given in Table 6.3 is also available for other companies, then the table would become a manifold table.

Table 6.3 Candidates Interviewed for Employment in a Company

Candidates Profile	Number of Candidates						Total
	Males			Females			
	Married	Unmarried	Total	Married	Unmarried	Total	
Experienced	15	20	35	5	10	15	50
Inexperienced	2	8	10	10	50	60	70
Total	17	28	45	15	60	75	120

Original and Derived Tables: Original tables are also called *classification tables*. Such a table contains data collected from a primary source. But if the information given in a table has been derived from a general table, then such a table is called a *derived table*.

Example 6.1: A state government has taken up a scheme of providing drinking water to every village. During the first 4 years of a five-year plan, the government has installed 39,664 tubewells. Out of the funds earmarked for natural calamities, the government has sunk 14,072 tubewells during the first 4 years of the plan. Thus, out of the plan fund 9245 and 8630 tubewells were sunk in 2000-01 and 2001-02, respectively. Out of the natural calamities fund, the number of tubewells sunk in 1998-99 and 1999-2000 were 4511 and 637, respectively. The expenditure for 2000-01 and 2001-02 was ₹ 863.41 lakh and ₹ 1185.65 lakh, respectively.

The number of tubewells installed in 2002-03 was 16,740 out of which 4800 were installed out of the natural calamities fund and the expenditure of sinking of tubewells during 2002-03 was ₹ 1411.17 lakh.

The number of tubewells installed in 2003-04 was 9849, out of which 9849 tubewells were sunk out of the fund for the plan and the total expenditure during the first 4 years was ₹ 5443.05 lakh.

Represent this data in a tabular form.

Solution: The data of the problem is summarized in Table 6.4.

Table 6.4 Tubewells for Drinking Water for Villages in a State

Year	Number of Tubewells		Expenditure (in ₹ lakh)
	Out of Fund Plan	Out of Natural Calamities Fund	
2000-01	9245	4511	863.41
2001-02	8630	637	1185.65
2002-03	(16,740 - 4800) = 11,940	4800	1411.17
2003-04	9849	(13,973 - 9849) = 4124	1982.82
Total	39,664	14,072	5,443.05

Example 6.2: In a sample study about coffee-drinking habits in two towns, the following information was received:

Town A : Females were 40 per cent. Total coffee drinkers were 45 per cent and male non-coffee drinkers were 20 per cent

Town B : Males were 55 per cent. Male non-coffee drinkers were 30 per cent and female coffee drinkers were 15 per cent.

Represent this data in a tabular form.

Solution: The given data is summarized in Table 6.5.

Table 6.5 Coffee Drinking Habit of Towns A and B (in Percentage)

Attribute	Town A			Town B		Total (1) + (2)
	Males	Females	Total (1)	Males	Females	
Coffee drinkers	(45 - 5) = 40	(40 - 35) = 5	45	(55 - 30) = 25	15	40
Non-coffee drinkers	20	(55 - 20) = 35	(100 - 45) = 55	30	(60 - 30) = 30	60
Total	(100 - 40) = 60	40	100	55	(100 - 55) = 45	100

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Example 6.3: Industrial finance in India has showed great variation in respect of sources of funds during the first, second, and third five-year plans. There were two main sources—internal and external. The internal sources of funds are depreciation, free reserves, and surplus. The external sources of funds are capital issues and borrowings.

During the first plan, internal and external sources accounted for 62 per cent and 38 per cent of the total, and of the depreciation, fresh capital, and other sources formed 29 per cent, 7 per cent, and 10.6 per cent, respectively.

During the second plan, internal sources decreased by 17.3 per cent compared to the first plan, and depreciation was 24.5 per cent. The external finance during the same period consisted of 10.9 per cent fresh capital and 28.9 per cent borrowings.

Compared to the second plan, external finance during the third plan decreased by 4.4 per cent, and borrowings and 'other sources' were 29.4 per cent and 14.9 per cent respectively. During the third plan, internal finance increased by 4.4 per cent and free reserves and surplus formed 18.6 per cent.

Tabulate this information with the above details as clearly as possible observing the rules of tabulation.

Solution: The given information is summarized in Table 6.6.

Table 6.6 Pattern of Industrial Finance (in Percentage)

Five Year Plan	Sources of Funds						
	Internal			External			
	Depreciation	Free Reserves and Surplus	Total	Capital Issues	Borrowings	Other Sources	Total
First	29	62 - 29 = 33	62	7	38 - 7 = 31	10.6	38
Second	24.5	44.7 - 24.5 = 20.2	62 - 17.3 = 44.7	10.9	28.9	55.3 - 10.9 = 44.4	100 - 44.7 = 55.3
Third	49.1 - 18.6 = 30.5	18.6	44.7 + 4.4 = 49.1	50.9 - 29.4 = 21.5	29.4	14.9	55.3 - 4.4 = 50.9

6.4 MEASURES OF CENTRAL TENDENCY

There are several commonly used measures of central tendency such as arithmetic mean, mode and median. These values are very useful not only in presenting the overall picture of the entire data but also for the purpose of making comparisons among two or more sets of data.

As an example, questions like 'How hot is the month of June in Delhi?' can be answered, generally by a single figure of the average for that month. Similarly, suppose we want to find out if boys and girls at age 10 years differ in height for the purpose of making comparisons. Then, by taking the average height of boys of that age and average height of girls of the same age, we can compare and record the differences.

While arithmetic mean is the most commonly used measure of central location, mode and median are more suitable measures under certain set of conditions and for certain types of data. However, each measure of central tendency should meet the following requisites.

Check Your Progress

4. Name the different parts of a table.
5. Mention the sub-categories of a complex table.

- It should be easy to calculate and understand.
- It should be rigidly defined. It should have only one interpretation so that the personal prejudice or bias of the investigator does not affect its usefulness.
- It should be representative of the data. If it is calculated from a sample, then the sample should be random enough to be accurately representing the population.
- It should have sampling stability. It should not be affected by sampling fluctuations. This means that if we pick 10 different groups of college students at random and compute the average of each group, then we should expect to get approximately the same value from each of these groups.
- It should not be affected much by extreme values. If few very small or very large items are present in the data, they will unduly influence the value of the average by shifting it to one side or other, so that the average would not be really typical of the entire series. Hence, the average chosen should be such that it is not unduly affected by such extreme values.

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Let us consider the three measures of central tendency:

(i) Arithmetic Mean

This is also commonly known as simply the mean. Even though average, in general, means any measure of central location, when we use the word average in our daily routine, we always mean the arithmetic average. The term is widely used by almost every one in daily communication. We speak of an individual being an average student or of average intelligence. We always talk about average family size or average family income or Grade Point Average (GPA) for students and so on.

Combined Mean: If the arithmetic averages and the number of items in two or more related groups are known, the combined (or composite) mean of the entire group can be obtained by the following formula:

$$\bar{X} = \left[\frac{n_1 \bar{x}_1 + n_2 \bar{x}_2}{n_1 + n_2} \right]$$

The advantage of combined arithmetic mean is that, one can determine the overall mean of the combined data without having to go back to the original data.

An example:

Find the combined mean for the data given below.

$$n_1 = 10, x_1 = 2, n_2 = 15, x_2 = 3$$

Solution:

$$\begin{aligned} \bar{X} &= \left[\frac{n_1 \bar{x}_1 + n_2 \bar{x}_2}{n_1 + n_2} \right] \\ &= \left[\frac{10 \times 2 + 15 \times 3}{10 + 15} \right] \\ &= \frac{20 + 45}{25} \\ &= 2.6 \end{aligned}$$

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For discussion purposes, let us assume a variable X which stands for some scores such as the ages of students. Let the ages of 5 students be 19, 20, 22, 22 and 17 years. Then variable X would represent these ages as follows:

$$X: 19, 20, 22, 22, 17$$

Placing the Greek symbol Σ (Sigma) before X would indicate a command that all values of X are to be added together. Thus:

$$\Sigma X = 19 + 20 + 22 + 22 + 17$$

The mean is computed by adding all the data values and dividing it by the number of such values. The symbol used for sample average is \bar{X} so that:

$$\bar{X} = \frac{19 + 20 + 22 + 22 + 17}{5}$$

In general, if there are n values in the sample, then

$$\bar{X} = \frac{X_1 + X_2 + \dots + X_n}{n}$$

In other words,

$$\bar{X} = \frac{\sum_{i=1}^n X_i}{n}, \quad i = 1, 2, \dots, n.$$

The above formula states, add up all the values of X , where the value of i starts at 1 and ends at n with unit increments so that $i = 1, 2, 3, \dots, n$.

If instead of taking a sample, we take the entire population in our calculations of the mean, then the symbol for the mean of the population is μ (mu) and the size of the population is N , so that:

$$\mu = \frac{\sum_{i=1}^N X_i}{N}, \quad i = 1, 2, \dots, N.$$

If we have the data in grouped discrete form with frequencies, then the sample mean is given by:

$$\bar{X} = \frac{\Sigma f(X)}{\Sigma f}$$

where Σf = Summation of all frequencies
 $\Sigma f(X)$ = Summation of each value of X multiplied by its corresponding frequency (f)

Example 6.4: Let us take the ages of 10 students as follows:

19, 20, 22, 22, 17, 22, 20, 23, 17, 18

This data can be arranged in a frequency distribution as follows:

(X)	(f)	f(X)
17	2	34
18	1	18
19	1	19
20	2	40
22	3	66
23	1	23
Total = 10		200

In the above case, we have $\Sigma f = 10$ and $\Sigma f(X) = 200$, so that:

$$\begin{aligned}\bar{X} &= \frac{\Sigma f(X)}{\Sigma f} \\ &= 200/10 = 20\end{aligned}$$

Characteristics of the Mean

The arithmetic mean has three interesting properties. These are:

1. The sum of the deviations of individual values of X from the mean will always add up to zero. This means that if we subtract all the individual values from their mean, then some values will be negative and some will be positive, but if all these differences are added together then the total sum will be zero. In other words, the positive deviations must balance the negative deviations. Or symbolically:

$$\sum_{i=1}^n (X_i - \bar{X}) = 0, i = 1, 2, \dots, n.$$

2. The second important characteristic of the mean is that it is very sensitive to extreme values. Since the computation of the mean is based upon inclusion of all values in the data, an extreme value in the data would shift the mean towards it, thus, making the mean unrepresentative of the data.
3. The third property of the mean is that the sum of squares of the deviations about the mean is minimum. This means that if we take differences between individual values and the mean and square these differences individually and then add these squared differences, then the final figure will be less than the sum of the squared deviations around any other number other than the mean. Symbolically, it means that:

$$\sum_{i=1}^n (X_i - \bar{X})^2 = \text{Minimum}, i = 1, 2, \dots, n.$$

(ii) Mode

The mode is another form of average and can be defined as the most frequently occurring value in the data. The mode is not affected by extreme values in the data and can easily be obtained from an ordered set of data. It can be useful and more representative of the data under certain conditions and is the only measure of central tendency that can be used for qualitative data. For instance, when a researcher quotes the opinion of an average person, he is probably referring to the most frequently expressed opinion which is the modal opinion. In our example of ages of 10 students as:

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19, 20, 22, 22, 17, 22, 20, 23, 17 and 18

The mode is 22, since it occurs more often than any other value in this data.

(III) Median

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The second measure of central tendency that has a wide usage in statistical works is the median. Median is that *value* of a variable which divides the series in such a manner that the number of items below it is equal to the number of items above it. Half the total number of observations lie below the median, and half above it. The median is thus a positional average.

The median of ungrouped data is found easily if the items are first arranged in order of the magnitude. The median may then be located simply by counting, and its value can be obtained by reading the value of the middle observations. If we have five observations whose values are 8, 10, 1, 3 and 5, the values are first arrayed: 1, 3, 5, 8 and 10. It is now apparent that the value of the median is 5, since two observations are below that value and two observations are above it. When there is an even number of cases, there is no actual middle item and the median is taken to be the average of the values of the items lying on either side of $(N + 1)/2$, where N is the total number of items. Thus, if the values of six items of a series are 1, 2, 3, 5, 8 and 10, then the median is the value of item number $(6 + 1)/2 = 3.5$, which is approximated as the average of the third and the fourth items, i.e., $(3+5)/2 = 4$.

Thus, the steps required for obtaining median are:

1. Arrange the data as an array of increasing magnitude.
2. Obtain the value of the $(N + 1)/2$ th item.

Even in the case of grouped data, the procedure for obtaining median is straightforward as long as the variable is discrete or non-continuous as is clear from the following example.

Example 6.5: Obtain the median size of shoes sold from the following data.

Number of Shoes Sold by Size in One Year

Size	Number of Pairs	Cumulative Total
5	30	30
$5\frac{1}{2}$	40	70
6	50	120
$6\frac{1}{2}$	150	270
7	300	570
$7\frac{1}{2}$	600	1170
8	950	2120
$8\frac{1}{2}$	820	2940
9	750	3690
$9\frac{1}{2}$	440	4130
10	250	4380
$10\frac{1}{2}$	150	4530
11	40	4570
$11\frac{1}{2}$	39	4609
Total		4609

Solution: Median, is the value of $\frac{(N + 1)}{2}$ th = $\frac{4609 + 1}{2}$ th = 2305th item. Since the items are already arranged in ascending order (size-wise), the size of 2305th item is easily

determined by constructing the cumulative frequency. Thus, the median size of shoes sold is $8\frac{1}{2}$, the size of 2305th item.

In the case of grouped data with continuous variable, the determination of median is a bit more involved. Consider the following table where the data relating to the distribution of male workers by average monthly earnings is given. Clearly the median of 6291 is the earnings of $(6291 + 1)/2 = 3146$ th worker arranged in ascending order of earnings.

From the cumulative frequency, it is clear that this worker has his income in the class interval 67.5–72.5. But, it is impossible to determine his exact income. We therefore, resort to approximation by assuming that the 795 workers of this class are distributed uniformly across the interval 67.5 to 72.5. The median worker is $(3146 - 2713) = 433$ rd of these 795, and hence, the value corresponding to him can be approximated as,

$$67.5 + \frac{433}{795} \times (72.5 - 67.5) = 67.5 + 2.73 = 70.23$$

Distribution of Male Workers by Average Monthly Earnings

Group No.	Monthly Earnings (₹)	No. of Workers	Cumulative No. of Workers
1	27.5–32.5	120	120
2	32.5–37.5	152	272
3	37.5–42.5	170	442
4	42.5–47.5	214	656
5	47.5–52.5	410	1066
6	52.5–57.5	429	1495
7	57.5–62.5	568	2063
8	62.5–67.5	650	2713
9	67.5–72.5	795	3508
10	72.5–77.5	915	4423
11	77.5–82.5	745	5168
12	82.5–87.5	530	5698
13	87.5–92.5	259	5957
14	92.5–97.5	152	6109
15	97.5–102.5	107	6216
16	102.5–107.5	50	6266
17	107.5–112.5	25	6291
Total			6291

The value of the median can thus be put in the form of the formula,

$$Me = l + \frac{\frac{N+1}{2} - C}{f} \times i$$

Where l is the lower limit of the median class, i its width, f its frequency, C the cumulative frequency upto (but not including) the median class, and N is the total number of cases.

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Finding median by graphical analysis

The median can quite conveniently be determined by reference to the ogive which plots the cumulative frequency against the variable. The value of the item below which half the items lie, can easily be read from the ogive.

Example 6.6: Obtain the median of data given in the following table.

Monthly Earnings	Frequency	Less Than	More Than
27.5	—	0	6291
32.5	120	120	6171
37.5	152	272	6019
42.5	170	442	5849
47.5	214	656	5635
52.5	410	1066	5225
57.5	429	1495	4796
62.5	568	2063	4228
67.5	650	2713	3578
72.5	795	3508	2783
77.5	915	4423	1868
82.5	745	5168	1123
87.5	530	5698	593
92.5	259	5957	334
97.5	152	6109	182
102.5	107	6216	75
107.5	50	6266	25
112.5	25	6291	0

Solution: It is clear that this is grouped data. The first class is 27.5–32.5, whose frequency is 120, and the last class is 107.5–112.5, whose frequency is 25. Figure 6.2 shows the ogive of less than cumulative frequency. The median is the value below which $N/2$ items lie, is $6291/2 = 3145.5$ items lie, which is read of from Figure 6.3 as about 70. More accuracy than this is unobtainable because of the space limitation on the earning scale.

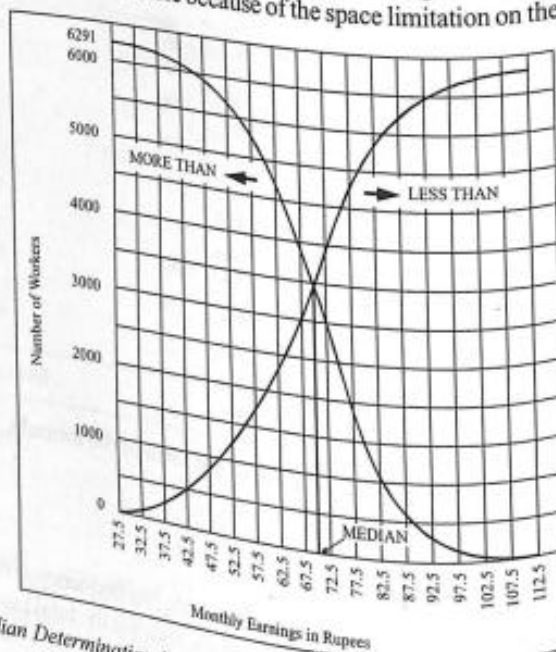


Fig. 6.2 Median Determination by Plotting Less Than and More Than Cumulative Frequency

The median can also be determined by plotting both 'less than' and 'more than' cumulative frequency as shown in Figure 6.2. It should be obvious that the two curves should intersect at the median of the data.

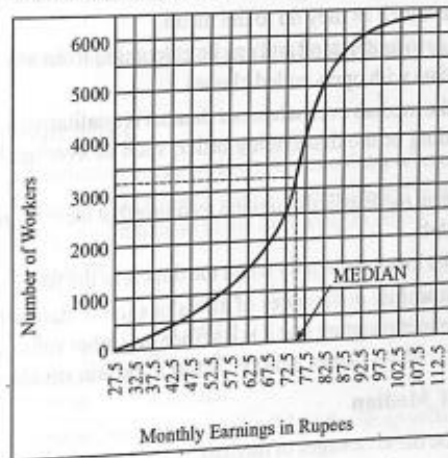


Fig. 6.3 Median

NOTES

Advantages of Mean

The following are advantages of mean:

- Its concept is familiar to most people and is intuitively clear.
- Every data set has a mean, which is unique and describes the entire data to some degree. For instance, when we say that the average salary of a professor is ₹ 25,000 per month, it gives us a reasonable idea about the salaries of professors.
- It is a measure that can be easily calculated.
- It includes all values of the data set in its calculation.
- Its value varies very little from sample to sample taken from the same population.
- It is useful for performing statistical procedures, such as computing and comparing the means of several data sets.

Disadvantages of Mean

The following are disadvantages of mean:

- It is affected by extreme values and, hence, not very reliable when the data set has extreme values especially when these extreme values are on one side of the ordered data. Thus, a mean of such data is not truly a representative of such data. For instance, the average age of three persons of ages 4, 6 and 80 years gives us an average of 30.
- It is tedious to compute for a large data set as every point in the data set is to be used in computations.
- We are unable to compute the mean for a data set that has open-ended classes either at the high or at the low end of the scale.
- The mean cannot be calculated for qualitative characteristics, such as beauty or intelligence, unless these can be converted into quantitative figures, such as intelligence into IQs.

NOTES

Advantages of Median

The following are the advantages of median:

- Median is a positional average and, hence, the extreme values in the data set do not affect it as much as they do to the mean.
- Median is easy to understand and can be calculated from any kind of data, even for grouped data with open-ended classes.
- We can find the median even when our data set is qualitative and can be arranged in the ascending or the descending order, such as average beauty or average intelligence.
- Similar to mean, median is also unique meaning that there is only one median in a given set of data.
- Median can be located visually when the data is in the form of ordered data.
- The sum of absolute differences of all values in the data set from the median value is minimum meaning that it is less than any other value of central tendency in the data set, which makes it more central in certain situations.

Disadvantages of Median

The following are the disadvantages of median:

- The data must be arranged in order to find the median. This can be very time consuming for a large number of elements in the data set.
- The value of the median is affected more by sampling variations. Different samples from the same population may give significantly different values of the median.
- The calculation of median in case of grouped data is based on the assumption that the values of observations are evenly spaced over the entire class interval and this is usually not so.
- Median is comparatively less stable than the mean, particularly for small samples due to fluctuations in sampling.
- Median is not suitable for further mathematical treatment. For instance, we cannot compute the median of the combined group from the median values of different groups.

Advantages of Mode

The following are the advantages of mode:

- Similar to median, the mode is not affected by extreme values in the data.
- Its value can be obtained in open-ended distributions without ascertaining the class limits.
- It can be easily used to describe qualitative phenomenon. For instance, if most people prefer a certain brand of tea then this will become the modal point.
- Mode is easy to calculate and understand. In some cases, it can be located simply by observation or inspection.

Disadvantages of Mode

The following are the disadvantages of mode:

- Quite often, there is no modal value.
- It can be bi-modal or multi-modal or it can have all modal values making its significance more difficult to measure.
- If there is more than one modal value, the data is difficult to interpret.

- A mode is not suitable for algebraic manipulations.
- Since the mode is the value of maximum frequency in the data set, it cannot be rigidly defined if such frequency occurs at the beginning or at the end of the distribution.
- It does not include all observations in the data set and, hence, less reliable in most of the situations.

NOTES

Weighted Arithmetic Mean

In the computation of arithmetic mean we had given equal importance to each observation in the series. This equal importance may be misleading if the individual values constituting the series have different importance as in the following example:

The Raja Toy shop sells	
Toy Cars at	₹ 3 each
Toy Locomotives at	₹ 5 each
Toy Aeroplanes at	₹ 7 each
Toy Double Decker at	₹ 9 each

What shall be the average price of the toys sold, if the shop sells 4 toys, one of each kind?

$$\text{Mean Price, i.e., } \bar{x} = \frac{\sum x}{4} = \text{Rs } \frac{24}{4} = \text{₹ } 6$$

In this case the importance of each observation (Price quotation) is equal in as much as one toy of each variety has been sold. In the above computation of the arithmetic mean this fact has been taken care of by including 'once only' the price of each toy.

But if the shop sells 100 toys: 50 cars, 25 locomotives, 15 aeroplanes and 10 double deckers, the importance of the four price quotations to the dealer is **not equal** as a source of earning revenue. In fact, their respective importance is equal to the number of units of each toy sold, i.e.,

The importance of Toy Car	50
The importance of Locomotive	25
The importance of Aeroplane	15
The importance of Double Decker	10

It may be noted that 50, 25, 15, 10 are the quantities of the various classes of toys sold. It is for these quantities that the term 'weights' is used in statistical language. Weight is represented by symbol 'w', and $\sum w$ represents the sum of weights.

While determining the 'average price of toy sold' these weights are of great importance and are taken into account in the manner illustrated below:

$$\bar{x} = \frac{w_1x_1 + w_2x_2 + w_3x_3 + w_4x_4}{w_1 + w_2 + w_3 + w_4} = \frac{\sum wx}{\sum w}$$

When w_1, w_2, w_3, w_4 are the respective weights of x_1, x_2, x_3, x_4 which in turn represent the price of four varieties of toys, viz., car, locomotive, aeroplane and double decker, respectively.

$$\begin{aligned} \bar{x} &= \frac{(50 \times 3) + (25 \times 5) + (15 \times 7) + (10 \times 9)}{50 + 25 + 15 + 10} \\ &= \frac{(150) + (125) + (90) + (90)}{100} = \frac{470}{100} = \text{₹ } 4.70 \end{aligned}$$

The table summarizes the steps taken in the computation of the weighted arithmetic mean.

$$\Sigma w = 100; \Sigma wx = 470$$

$$\bar{x} = \frac{\Sigma wx}{\Sigma w} = \frac{470}{100} = 4.70$$

NOTES

The weighted arithmetic mean is particularly useful where we have to compute the *mean of means*. If we are given two arithmetic means, one for each of two different series, in respect of the *same variable*, and are required to find the arithmetic mean of the combined series, the weighted arithmetic mean is the only suitable method of its determination.

Weighted Arithmetic Mean of Toys Sold by the Raja Toy Shop

Toys	Price per Toy ₹x	Number Sold w	Price × Weight xw
Car	3	50	150
Locomotive	5	25	125
Aeroplane	7	15	105
Double Decker	9	10	90
		$\Sigma w = 100$	$\Sigma xw = 470$

Example 6.7: The arithmetic mean of daily wages of two manufacturing concerns A Ltd. and B Ltd. is ₹ 5 and ₹ 7, respectively. Determine the average daily wages of both concerns if the number of workers employed were 2,000 and 4,000, respectively.

Solution: (i) Multiply each average (viz. 5 and 7) by the number of workers in the concern it represents.

(ii) Add up the two products obtained in (i) above and

(iii) Divide the total obtained in (ii) by the total number of workers.

Weighted Mean of Mean Wages of A Ltd. and B Ltd.

Manufacturing Concern	Mean Wages x	Workers Employed w	Mean Wages × Workers Employed wx
A Ltd.	5	2,000	10,000
B Ltd.	7	4,000	28,000
		$\Sigma w = 6,000$	$\Sigma wx = 38,000$

$$\begin{aligned} \bar{x} &= \frac{\Sigma wx}{\Sigma w} \\ &= \frac{38,000}{6,000} \\ &= ₹ 6.33 \end{aligned}$$

The above mentioned examples explain that 'Arithmetic Means and Percentage' are not original data. They are derived figures and their importance is relative to the original data from which they are obtained. This relative importance must be taken into account by weighting while averaging them (means and percentage).

Harmonic Mean

If *a, b, c* are in HP, then *b* is called a *Harmonic Mean* between *a* and *c*, written as HM.

Harmonical Progression

Non zero quantities whose reciprocals are in AP, are said to be in *Harmonical Progression*, written as HP

Consider the following examples:

- (i) $1, \frac{1}{3}, \frac{1}{5}, \frac{1}{7}, \dots$
- (ii) $\frac{1}{2}, \frac{1}{5}, \frac{1}{8}, \frac{1}{11}, \dots$
- (iii) $2, \frac{5}{2}, \frac{10}{3}, \dots$
- (iv) $\frac{1}{a}, \frac{1}{a+b}, \frac{1}{a+2b}, \dots, a, b > 0$
- (v) $5, \frac{55}{9}, \frac{55}{7}, 11, \dots$

It can be easily checked that in each case, the series obtained by taking reciprocal of each of the term is an AP.

To Insert n Harmonic Means between a and b

Let $H_1, H_2, H_3, \dots, H_n$ be the required Harmonic Means. Then $a, H_1, H_2, \dots, H_n, b$ are in HP

i.e., $\frac{1}{a}, \frac{1}{H_1}, \frac{1}{H_2}, \dots, \frac{1}{H_n}, \frac{1}{b}$ are in AP

Then, $\frac{1}{b} = (n+2)$ th term of an AP

$$= \frac{1}{a} + (n+1)d$$

Where d is the common difference of AP

This gives, $d = \frac{a-b}{(n+1)ab}$

Now, $\frac{1}{H_1} = \frac{1}{a} + d = \frac{1}{a} + \frac{a-b}{(n+1)ab}$
 $= \frac{nb + b + a - b}{(n+1)ab} = \frac{a+nb}{(n+1)ab}$

So, $\frac{1}{H_1} = \frac{a+nb}{(n+1)ab}$

$\Rightarrow H_1 = \frac{(n+1)ab}{a+nb}$

Again, $\frac{1}{H_2} = \frac{1}{a} + 2d = \frac{1}{a} + \frac{2(a-b)}{(n+1)ab}$
 $= \frac{nb + b + 2a - 2b}{(n+1)ab} = \frac{2a - b + nb}{(n+1)ab}$

$\Rightarrow H_2 = \frac{(n+1)ab}{2a - b + nb}$

Similarly, $\frac{1}{H_3} = \frac{1}{a} + 3d = \frac{3a - 2b + nb}{(n+1)ab}$

$\Rightarrow H_3 = \frac{(n+1)ab}{3a - 2b + nb}$ and so on,

$\Rightarrow \frac{1}{H_n} = \frac{1}{a} + nd = \frac{1}{a} + \frac{n(a-b)}{(n+1)ab}$

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$$= \frac{nb + b + na - nb}{(n+1)ab}$$

$$= \frac{na + b}{(n+1)ab} \Rightarrow H_n = \frac{(n+1)ab}{na + b}$$

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Example 6.8: Find the 5th term of $2, 2\frac{1}{2}, 3\frac{1}{3}, \dots$

Solution: Let 5th term be x . Then, $\frac{1}{x}$ is 5th term of corresponding AP $\frac{1}{2}, \frac{2}{5}, \frac{3}{10}, \dots$

Then,
$$\frac{1}{x} = \frac{1}{2} + 4\left(\frac{2}{5} - \frac{1}{2}\right) = \frac{1}{2} + 4\left(\frac{-1}{10}\right)$$

$$\Rightarrow \frac{1}{x} = \frac{1}{2} - \frac{2}{5} = \frac{1}{10} \Rightarrow x = 10$$

Example 6.9: Insert two harmonic means between $\frac{1}{2}$ and $\frac{4}{17}$.

Solution: Let H_1, H_2 be two harmonic means between $\frac{1}{2}$ and $\frac{4}{17}$

Thus, $2, \frac{1}{H_1}, \frac{1}{H_2}, \frac{17}{4}$ are in AP. Let d be their common difference

Then,
$$\frac{17}{4} = 2 + 3d$$

$$\Rightarrow 3d = \frac{9}{4} \Rightarrow d = \frac{3}{4}$$

Thus,
$$\frac{1}{H_1} = 2 + \frac{3}{4} = \frac{11}{4} \Rightarrow H_1 = \frac{4}{11}$$

$$\frac{1}{H_2} = 2 + 2 \times \frac{3}{4} = \frac{7}{2} \Rightarrow H_2 = \frac{2}{7}$$

Required harmonic means are $\frac{4}{11}, \frac{2}{7}$.

6.5 MEASURES OF DISPERSION

A measure of dispersion, or simply dispersion may be defined as statistics signifying the extent of the scatteredness of items around a measure of central tendency.

A measure of dispersion may be expressed in an 'absolute form', or in a 'relative form'. It is said to be in an absolute form when it states the actual amount by which the value of an item on an average deviates from a measure of central tendency. Absolute measures are expressed in concrete units, i.e., units in terms of which the data have been expressed, for example, rupees, centimetres, kilograms, and so on, and are used to describe frequency distribution.

A relative measure of dispersion computed is a quotient obtained by dividing the absolute measures by a quantity in respect to which absolute deviation has been computed. It is as such a pure number and is usually expressed in a percentage form. Relative measures are used for making comparisons between two or more distributions.

Check Your Progress

6. What are the different methods of measuring central tendency?
7. List two essential characteristics of the mean.

A measure of dispersion should possess all those characteristics which are considered essential for a measure of central tendency, which are as follows:

- (i) It should be based on all observations.
- (ii) It should be readily comprehensible.
- (iii) It should be fairly easily calculated.
- (iv) It should be affected as little as possible by fluctuations of sampling.
- (v) It should be amenable to algebraic treatment.

Some common measures of dispersion are (i) The range, (ii) the semi-interquartile range or the quartile deviation, (iii) the mean deviation, and (iv) the standard deviation. Of these, the standard deviation is the best measure.

6.5.1 Range

The crudest measure of dispersion is the range of the distribution. The range of any series is the difference between the highest and the lowest values in the series. If the marks received in an examination taken by 248 students are arranged in ascending order, then the range will be equal to the difference between the highest and the lowest marks.

In a frequency distribution, the range is taken to be the difference between the lower limit of the class at the lower extreme of the distribution and the upper limit of the class at the upper extreme.

Consider the data on weekly earnings of worker on four workshops given in Table 6.8.

From these figures in Table 6.8, it is clear that the greater the range, the greater is the variation of the values in the group.

The range is a measure of absolute dispersion and as such cannot be usefully employed for comparing the variability of two distributions expressed in different units. The amount of dispersion measured, say, in pounds, is not comparable with dispersion measured in inches. Thus, the need of measuring relative dispersion arises.

An absolute measure can be converted into a relative measure if we divide it by some other value regarded as standard for the purpose. We may use the mean of the distribution or any other positional average as the standard.

For Table 6.8, the relative dispersion would be,

$$\text{Workshop A} = \frac{9}{25.5} \quad \text{Workshop C} = \frac{23}{25.5}$$

$$\text{Workshop B} = \frac{15}{25.5} \quad \text{Workshop D} = \frac{15}{25.5}$$

An alternate method of converting an absolute variation into a relative one would be to use the total of the extremes as the standard. This will be equal to dividing the difference of the extreme items by the total of the extreme items. Thus,

$$\text{Relative Dispersion} = \frac{\text{Difference of extreme items, i.e., Range}}{\text{Sum of extreme items}}$$

The relative dispersion of the series is called the coefficient or ratio of dispersion. In our example of weekly earnings of workers considered earlier, the coefficients would be,

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$$\text{Workshop } A = \frac{9}{21+30} = \frac{9}{51}$$

$$\text{Workshop } B = \frac{15}{17+32} = \frac{15}{49}$$

$$\text{Workshop } C = \frac{23}{15+38} = \frac{23}{53}$$

$$\text{Workshop } D = \frac{15}{19+34} = \frac{15}{53}$$

Merits and Limitations of Range

Merits

Of the various characteristics that a good measure of dispersion should possess, the range has only two, which are as follows:

- (i) It is easy to understand.
- (ii) Its computation is simple.

Limitations

Besides the aforesaid two qualities, the range does not satisfy the other test of a good measure and, hence, it is often termed as a crude measure of dispersion.

The following are the limitations that are inherent in the range as a concept of variability:

- (i) Since it is based upon two extreme cases in the entire distribution, the range may be considerably changed if either of the extreme cases happens to drop out, while the removal of any other case would not affect it at all.
- (ii) It does not tell anything about the distribution of values in the series relative to a measure of central tendency.
- (iii) It cannot be computed when distribution has open-end classes.
- (iv) It does not take into account the entire data. These can be illustrated by the following illustration. Consider the data given in Table 6.7.

Table 6.7 Distribution with the Same Number of Cases, but Different Variability

Class	No. of students		
	Section A	Section B	Section C
0-10	...	...	...
10-20	...	...	...
20-30	1	...	...
30-40	12	...	...
40-50	17	12	19
50-60	29	20	18
60-70	18	35	16
70-80	16	25	18
80-90	6	10	18
90-100	11	8	21
Total	...	...	...
Range	110	...	...
	80	110	110
		60	60

The table is designed to illustrate three distributions with the same number of cases but different variability. The removal of two extreme students from Section A would make its range equal to that of B or C.

The greater range of A is not a description of the entire group of 110 students, but of the two most extreme students only. Further, though sections B and C have the same range, the students in Section B cluster more closely around the central tendency of the group than they do in Section C . Thus, the range fails to reveal the greater homogeneity of B or the greater dispersion of C . Due to this defect, it is seldom used as a measure of dispersion.

Specific Uses of Range

In spite of the numerous limitations of the range as a measure of dispersion, it is the most appropriate under the following circumstances:

- (i) In situations where the extremes involve some hazard for which preparation should be made, it may be more important to know the most extreme cases to be encountered than to know anything else about the distribution. For example, an explorer, would like to know the lowest and the highest temperatures on record in the region he is about to enter; or an engineer would like to know the maximum rainfall during 24 hours for the construction of a storm water drain.
- (ii) In the study of prices of securities, range has a special field of activity. Thus, to highlight fluctuations in the prices of shares or bullion, it is a common practice to indicate the range over which the prices have moved during a certain period of time. This information, besides being of use to the operators, gives an indication of the stability of the bullion market, or that of the investment climate.
- (iii) In statistical quality control, range is used as a measure of variation. We, for example, determine the range over which variations in quality are due to random causes, which is made the basis for the fixation of control limits.

6.5.2 Mean Deviation

In the following section, you will study that a weakness of the measures of dispersion, based upon the range or a portion thereof, is that the precise size of most of the variants has no effect on the result. As an illustration, the quartile deviation will be the same whether the variates between Q_1 and Q_3 are concentrated just above Q_1 , or they are spread uniformly from Q_1 to Q_3 . This is an important defect from the viewpoint of measuring the divergence of the distribution from its typical value. The mean deviation is employed to answer the objection.

Mean deviation, also called average deviation, of a frequency distribution is the mean of the absolute values of the deviation from some measure of central tendency. In other words, mean deviation is the arithmetic average of the variations (deviations) of the individual items of the series from a measure of their central tendency.

We can measure the deviations from any measure of central tendency, but the most commonly employed ones are the median and the mean. The median is preferred because it has the important property that the average deviation from it is the least.

Calculation of mean deviation then involves the following steps:

- (i) Calculate the median (or the mean) Me (or \bar{x}).
- (ii) Record the deviations $|d| = |x - Me|$ of each of the items, ignoring the sign.
- (iii) Find the average value of deviations.

$$\text{Mean Deviation} = \frac{\sum |d|}{N}$$

...(6.1)

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Example 6.10 explains it better.

Example 6.10: Calculate the mean deviation from the following data giving marks obtained by 11 students in a class test.

14, 15, 23, 20, 10, 30, 19, 18, 16, 25, 12.

Solution:

Median = Size of $\frac{11+1}{2}$ th item
 = size of 6th item = 18.

Serial No.	Marks	$|x - \text{Median}|$ $|d|$
1	10	8
2	12	6
3	14	4
4	15	3
5	16	2
6	18	0
7	19	1
8	20	2
9	23	5
10	25	7
11	30	12
		$\Sigma |d| = 50$

$$\begin{aligned} \text{Mean deviation from median} &= \frac{\Sigma |d|}{N} \\ &= \frac{50}{11} = 4.5 \text{ marks} \end{aligned}$$

For grouped data, it is easy to see that the mean deviation is given by

$$\text{Mean deviation} = \frac{\Sigma f |d|}{\Sigma f} \tag{6.2}$$

where,

$|d| = |x - \text{median}|$ for grouped discrete data

$|d| = M - \text{median}$ for grouped continuous data with M as the mid-value of a particular group.

Examples 6.10 and 6.11 illustrate the use of this formula.

Example 6.11: Calculate the mean deviation from the following data:

Size of item	6	7	8	9	10	11	12
Frequency	3	6	9	13	8	5	4

Solution:

Size	Frequency <i>f</i>	Cumulative frequency	Deviations from median (9) <i>|d|</i>	<i>f|d|</i>
6	3	3	3	9
7	6	9	2	12
8	9	18	1	9
9	13	31	0	0
10	8	39	1	8
11	5	44	2	10
12	4	48	3	12
	48			60

Median = the size of $\frac{48+1}{2} = 24.5$ th item which is 9.

Therefore, deviations *d* are calculated from 9, i.e., $|d| = |x - 9|$.

$$\text{Mean deviation} = \frac{\sum f|d|}{\sum f} = \frac{60}{48} = 1.25$$

Example 6.12: Calculate the mean deviation from the following data:

<i>x</i>	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
<i>f</i>	18	16	15	12	10	5	2	2

Solution:

This is a frequency distribution with continuous variable. Thus, deviations are calculated from mid-values.

<i>x</i>	Mid-value	<i>f</i>	Less than <i>cf.</i>	Deviation from median <i>|d|</i>	<i>f|d|</i>
0-10	5	18	18	19	342
10-20	15	16	34	9	144
20-30	25	15	49	1	15
30-40	35	12	61	11	132
40-50	45	10	71	21	210
50-60	55	5	76	31	155
60-70	65	2	78	41	82
70-80	75	2	80	51	102
		80			1182

Median = the size of $\frac{80}{2}$ th item

$$= 20 + \frac{6}{15} \times 10 = 24$$

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$$\begin{aligned}\text{and then, mean deviation} &= \frac{\sum f|d|}{\sum f} \\ &= \frac{1182}{80} = 14.775.\end{aligned}$$

NOTES**Merits and Demerits of the Mean Deviation****Merits**

The merits are as follows:

- (i) It is easy to understand.
- (ii) As compared to standard deviation (discussed later), its computation is simple.
- (iii) As compared to standard deviation, it is less affected by extreme values.
- (iv) Since it is based on all values in the distribution, it is better than range or quartile deviation.

Demerits

The demerits are as follows:

- (i) It lacks those algebraic properties which would facilitate its computation and establish its relation to other measures.
- (ii) Due to this, it is not suitable for further mathematical processing.

Coefficient of Mean Deviation

The coefficient or relative dispersion is found by dividing the mean deviations recorded. Thus,

$$\text{Coefficient of MD} = \frac{\text{Mean Deviation}}{\text{Mean}} \quad (\text{when deviations were recorded from the mean}) \quad \dots(6.3)$$

$$= \frac{\text{MD}}{\text{Median}} \quad (\text{when deviations were recorded from the median}) \quad \dots(6.4)$$

$$\begin{aligned}\text{Coefficient of MD} &= \frac{14.775}{24} \\ &= 0.616\end{aligned}$$

6.5.3 Standard Deviation

By far the most universally used and the most useful measure of dispersion is the standard deviation or root mean square deviation about the mean. We have seen that all the methods of measuring dispersion so far discussed are not universally adopted for want of adequacy and accuracy. The range is not satisfactory as its magnitude is determined by most extreme cases in the entire group. Further, the range is notable because it is dependent on the item whose size is largely a matter of chance. Mean deviation method is also an unsatisfactory measure of scatter, as it ignores the algebraic signs of deviation. We desire a measure of scatter which is free from these shortcomings. To some extent standard deviation is one such measure.

The calculation of standard deviation differs in the following respects from that of mean deviation. First, in calculating standard deviation, the deviations are squared. This is done so as to get rid of negative signs without committing algebraic violence. Further,

the squaring of deviations provides added weight to the extreme items, a desirable feature for certain types of series.

Second, the deviations are always recorded from the arithmetic mean because although the sum of deviations is the minimum from the median, the sum of squares of deviations is minimum when deviations are measured from the arithmetic average. The deviation from \bar{x} is represented by d .

Thus, standard deviation, σ (sigma) is defined as the square root of the mean of the squares of the deviations of individual items from their arithmetic mean.

$$\sigma = \sqrt{\frac{\sum(x - \bar{x})^2}{N}} \quad \dots(6.5)$$

For grouped data (discrete variables),

$$\sigma = \sqrt{\frac{\sum f(x - \bar{x})^2}{\sum f}} \quad \dots(6.6)$$

and, for grouped data (continuous variables),

$$\sigma = \sqrt{\frac{\sum f(M - \bar{x})^2}{\sum f}} \quad \dots(6.7)$$

where M is the mid-value of the group.

Example 6.13: Compute the standard deviation for the following data:

11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21.

Solution:

Here, formula (7) is appropriate. We first calculate the mean as $\bar{x} = \sum x/N = 176/11 = 16$, and then calculate the deviation as follows:

x	$(x - \bar{x})$	$(x - \bar{x})^2$
11	-5	25
12	-4	16
13	-3	9
14	-2	4
15	-1	1
16	0	0
17	+1	1
18	+2	4
19	+3	9
20	+4	16
21	+5	25
176		110

Thus, by formula (7),

$$\sigma = \sqrt{\frac{110}{11}} = \sqrt{10} = 3.16$$

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Example 6.14: Find the standard deviation of the data in the following distributions:

x	12	13	14	15	16	17	18	20
f	4	11	32	21	15	8	6	4

NOTES

Solution:

For this discrete variable grouped data, we use formula (8). Since for calculation of \bar{x} , we need $\sum fx$ and then for σ we need $\sum f(x - \bar{x})^2$, the calculations are conveniently made in the following format.

x	f	fx	$d = x - \bar{x}$	d^2	fd^2
12	4	48	-3	9	36
13	11	143	-2	4	44
14	32	448	-1	1	32
15	21	315	0	0	0
16	15	240	1	1	15
17	8	136	2	4	32
18	5	90	3	9	45
20	4	80	5	25	100
	100	1500			304

Here, $\bar{x} = \sum fx / \sum f = 1500/100 = 15$

and
$$\sigma = \sqrt{\frac{\sum fd^2}{\sum f}}$$

$$= \sqrt{\frac{304}{100}} = \sqrt{3.04} = 1.74$$

Calculation of Standard Deviation by Short-Cut Method

In most cases, it is very unlikely that \bar{x} will turn out to be an integer simplifying problems. In such cases, the calculation of d and d^2 becomes quite time-consuming. Short-cut methods have consequently been developed. These are on the same lines as those for calculation of mean itself.

In the short-cut method, we calculate deviations x' from an assumed mean A . Then for ungrouped data,

$$\sigma = \sqrt{\frac{\sum x'^2}{N} - \left(\frac{\sum x'}{N}\right)^2} \quad \dots(6.8)$$

and for grouped data

$$\sigma = \sqrt{\frac{\sum fx'^2}{\sum f} - \left(\frac{fx'}{\sum f}\right)^2} \quad \dots(6.9)$$

This formula is valid for both discrete and continuous variables. In case of continuous variables, x in the equation $x' = x - A$ stands for the mid-value of the class in question. Note that the second term in each of the formulae is a correction term because of the difference in the values of A and \bar{x} . When A is taken as \bar{x} itself, this correction is automatically reduced to zero. Examples 3.7 to 3.11 explain the use of these formulae.

Example 6.15: Compute the standard deviation by the short-cut method for the following data:

11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21

Solution: Let us assume that $A = 15$.

	$x' = (x - 15)$	x'^2
11	-4	16
12	-3	9
13	-2	4
14	-1	1
15	0	0
16	1	1
17	2	4
18	3	9
19	4	16
20	5	25
21	6	36
$N = 11$	$\sum x' = 11$	$\sum x'^2 = 121$

$$\begin{aligned}\sigma &= \sqrt{\frac{\sum x'^2}{N} - \left(\frac{\sum x'}{N}\right)^2} \\ &= \sqrt{\frac{121}{11} - \left(\frac{11}{11}\right)^2} \\ &= \sqrt{11 - 1} \\ &= \sqrt{10} \\ &= 3.16\end{aligned}$$

Another Method

If we assume A as zero, then the deviation of each item from the assumed mean is the same as the value of item itself. Thus, 11 deviates from the assumed mean of zero by 11, 12 deviates by 12 and so on. As such, we work with deviations without having to compute them and the formula takes the following shape:

x	x^2
11	121
12	144
13	169
14	196
15	225
16	256
17	289
18	324
19	361
20	400
21	441
176	2,926

NOTES

$$\sigma = \sqrt{\frac{\sum x^2}{N} - \left(\frac{\sum x}{N}\right)^2}$$

$$= \sqrt{\frac{2926}{11} - \left(\frac{176}{11}\right)^2} = \sqrt{266 - 256} = 3.16$$

NOTES

Combining Standard Deviations of Two Distributions

If we were given two sets of data of N_1 and N_2 items with means \bar{x}_1 and \bar{x}_2 and standard deviations σ_1 and σ_2 respectively, we can obtain the mean and standard deviation \bar{x} and σ of the combined distribution by the following formulae:

$$\bar{x} = \frac{N_1\bar{x}_1 + N_2\bar{x}_2}{N_1 + N_2} \quad \dots(6.10)$$

and
$$\sigma = \sqrt{\frac{N_1\sigma_1^2 + N_2\sigma_2^2 + N_1(\bar{x} - \bar{x}_1)^2 + N_2(\bar{x} - \bar{x}_2)^2}{N_1 + N_2}} \quad \dots(6.11)$$

Example 6.16: The mean and standard deviations of two distributions of 100 and 150 items are 50, 5 and 40, 6 respectively. Find the standard deviation of all taken together.

Solution:

Combined mean,

$$\bar{x} = \frac{N_1\bar{x}_1 + N_2\bar{x}_2}{N_1 + N_2} = \frac{100 \times 50 + 150 \times 40}{100 + 150}$$

$$= 44$$

Combined standard deviation,

$$\sigma = \sqrt{\frac{N_1\sigma_1^2 + N_2\sigma_2^2 + N_1(\bar{x} - \bar{x}_1)^2 + N_2(\bar{x} - \bar{x}_2)^2}{N_1 + N_2}}$$

$$= \sqrt{\frac{100 \times (5)^2 + 150(6)^2 + 100(44 - 50)^2 + 150(44 - 40)^2}{100 + 150}}$$

$$= 7.46.$$

Example 6.17: A distribution consists of three components with 200, 250, 300 items having mean 25, 10 and 15 and standard deviation 3, 4 and 5, respectively. Find the standard deviation of the combined distribution.

Solution:

In the usual notations, we are given here

$$N_1 = 200, N_2 = 250, N_3 = 300$$

$$\bar{x}_1 = 25, \bar{x}_2 = 10, \bar{x}_3 = 15$$

The formulae (12) and (13) can easily be extended for combination of three series as

$$\bar{x} = \frac{N_1\bar{x}_1 + N_2\bar{x}_2 + N_3\bar{x}_3}{N_1 + N_2 + N_3}$$

$$= \frac{200 \times 25 + 250 \times 10 + 300 \times 15}{200 + 250 + 300}$$

$$= \frac{12000}{750} = 16$$

and,

$$\sigma = \sqrt{\frac{N_1\sigma_1^2 + N_2\sigma_2^2 + N_3\sigma_3^2 + N_1(\bar{x} - \bar{x}_1)^2 + N_2(\bar{x} - \bar{x}_2)^2 + N_3(\bar{x} - \bar{x}_3)^2}{N_1 + N_2 + N_3}}$$

$$= \sqrt{\frac{200 \times 9 + 250 \times 16 + 300 \times 25 + 200 \times 81 + 250 \times 36 + 300 \times 1}{200 + 250 + 300}}$$

$$= \sqrt{51.73} = 7.19$$

6.6 SUMMARY

- Primary data is the information collected during the course of an experiment in experimental research. It can also be obtained through observation or through direct communication with the person associated with the selected subject by conducting surveys and interviews.
- There are several methods of collecting primary data. Some of these are:
 - o Observation
 - o Interviews
 - o Questionnaires
 - o Schedules
 - o Surveys
- Observation is the most common method of studying behavioural sciences. It is not a scientific method, but it becomes a scientific tool when used for formulating the purpose of a research.
- Though the observation method provides different ways of studying behavioural science, there are some limitations in using these methods.
- A personal interview involves two persons, i.e., the interviewer and the interviewee. The interviewer is the person who questions the interviewee. There is a face-to-face discussion between them.
- A survey is a scientific process of acquiring data and opinion from the public. Researchers undertake surveys in order to determine the opinion of the public regarding products, candidates and other topics; for example, a sample of voters is surveyed before an election to determine how the public perceives the candidates and their issues.
- Secondary data is the data which has already been collected and examined earlier by other investigators. While making use of the secondary data, the investigator has to first determine the sources from where the secondary data can be obtained.
- The case study method is the most common method of collecting secondary data. It is mainly used for the purpose of qualitative analysis. It involves a thorough and complete examination of a social unit.
- Tabulation is another way of summarizing and presenting the given data in a systematic form in rows and columns. Such presentation facilitates comparisons by bringing related information close to each other and helps in further statistical analysis and interpretation.

NOTES

Check Your Progress

8. Define measure of dispersion.
9. Name the common measures of dispersion.

NOTES

- The classification of tables depends on various aspects: objectives and scope of investigation, nature of data (primary or secondary) for investigation, extent of data coverage, and so on.
- Original tables are also called *classification tables*. Such a table contains data collected from a primary source. But if the information given in a table has been derived from a general table, then such a table is called a *derived table*.
- There are several commonly used measures of central tendency such as arithmetic mean, mode and median. These values are very useful not only in presenting the overall picture of the entire data but also for the purpose of making comparisons among two or more sets of data.
- While arithmetic mean is the most commonly used measure of central location, mode and median are more suitable measures under certain set of conditions and for certain types of data.
- In the computation of arithmetic mean we had given equal importance to each observation in the series.
- A measure of dispersion or simply dispersion may be defined as statistics signifying the extent of the scatteredness of items around a measure of central tendency.
- There are many types of measures of dispersion; one of this is the semi-interquartile range, usually termed as 'quartile deviation'.
- Mean deviation, also called average deviation, of a frequency distribution is the mean of the absolute values of the deviation from some measure of central tendency. In other words, mean deviation is the arithmetic average of the variations (deviations) of the individual items of the series from a measure of their central tendency.
- By far the most universally used and the most useful measure of dispersion is the standard deviation or root mean square deviation about the mean. We have seen that all the methods of measuring dispersion so far discussed are not universally adopted for want of adequacy and accuracy.

6.7 KEY TERMS

- **Primary data:** It is the information collected during the course of an experiment in experimental research.
- **Survey:** It is a scientific process of acquiring data and opinion from the public.
- **Tabulation:** It is another way of summarizing and presenting the given data in a systematic form in rows and columns.
- **Median:** The median is a measure of central tendency and it appears in the centre of an ordered data.

6.8 ANSWERS TO 'CHECK YOUR PROGRESS'

1. The various methods of collecting primary data are the following:
 - Observation
 - Interviews

- Questionnaires
 - Schedules
 - Surveys
2. Secondary data is the data which has already been collected and examined earlier by other investigators. While making use of the secondary data, the investigator has to first determine the sources from where the secondary data can be obtained.
 3. The case study method is the most common method of collecting secondary data.
 4. A table consists of a table number, title, caption and stubs, body, prefatory or head note and footnotes.
 5. The sub-categories of a complex table include the following:
 - Double or two-way table
 - Three-way table
 - Manifold (or Higher Order) table
 6. There are several commonly used measures of central tendency such as arithmetic mean, mode and median.
 7. Two essential characteristics of the mean are the following:
 - (i) The sum of the deviations of individual values of X from the mean will always add up to zero. This means that if we subtract all the individual values from their mean, then some values will be negative and some will be positive, but if all these differences are added together then the total sum will be zero.
 - (ii) The second important characteristic of the mean is that it is very sensitive to extreme values. Since the computation of the mean is based upon inclusion of all values in the data, an extreme value in the data would shift the mean towards it, thus making the mean unrepresentative of the data.
 8. A measure of dispersion or simply dispersion may be defined as statistics signifying the extent of the scatteredness of items around a measure of central tendency.
 9. Some common measures of dispersion are (i) The range, (ii) the semi-interquartile range or the quartile deviation, (iii) the mean deviation, and (iv) the standard deviation. Of these, the standard deviation is the best measure.

NOTES

6.9 QUESTIONS AND EXERCISES

Short-Answer Questions

1. Mention the types of observation methods.
2. What are the factors governing the selection of appropriate method for data collection?
3. List the essential requisites of the measurement of central tendency.
4. List the merits and demerits of range.
5. Mention the steps involved in the computation of mean deviation.

NOTES

Long-Answer Questions

1. Discuss the other methods of collecting primary data.
2. Explain the advantages and disadvantages of the case study method.
3. Write a detailed note on the types of tables.
4. Summarize the advantages and disadvantages of median.
5. Give examples of computation of harmonic mean.
6. Differentiate between the calculation of standard deviation and mean deviation.

6.10 FURTHER READING

- Tyagi, B.P. 1975. *Public Finance*. Meerut: Jai Prakash Nath and Co.
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