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BUREAU OF PUBLIC ROAD
U. S. DEPARTMENT OF COMMERCE

E. A. STROMBERG, Editor

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Highway Bond Financing

BY THE FINANCIAL AND ADMINISTRATIVE RESEARCH

AND THE RESEARCH REPORTS BRANCHES,

BUREAU OF PUBLIC ROADS

Reported by HUGO C. DUZAN,
WILLIAM R. McCALLUM,
and THOMAS R. TODD,
Transportation Economists

A review of the principles of public credit as applied to highways indicates that bond-issue financing can be used advantageously to accelerate the road-improvement program, particularly in the construction of expressways, large structures, and other primary improvements. The interest cost of a bond issue is justified by the advantages derived from the use of funds for construction now rather than at a future time as they accumulate from normal revenues. These advantages are derived in the form of added savings accruing to highway users because of earlier completion of the improvements and in the elimination of the cost of stop-gap improvements that would be necessary under a long-term current-revenue program.

The postwar need for highway modernization has caused an increasing trend among the States toward the use of credit financing. During the 5-year period 1946-50 the States, including special State authorities and commissions, issued \$1,057 million in highway bonds (not including refunding issues), the counties and other local rural units issued \$444 million, and the urban places \$685 million, making a total for the period of \$2,186 million. The amount of all highway and street debt outstanding at the end of 1950 was approximately \$4.5 billion. The latest available figures for 1951 indicate that approximately \$460 million in State highway issues alone were sold in that year.

Among bond issues at the State level the most publicized of recent developments has been the use of revenue-bond financing in the construction of toll roads. To a total of \$54 million in toll-road bonds outstanding at the end of 1945, \$449 million were added during the 6-year period 1946-51; \$12 million were retired, leaving \$491 million outstanding at the end of the period. Toll-bridge bonds increased in amount outstanding from \$315 million to \$445 million between 1945 and 1951.

Toll-free State issues outstanding at the end of 1945 were \$1,269 million; \$781 million were issued during the 6-year period and \$539 million were redeemed, leaving \$1,511 million outstanding at the end of 1951. Among toll-free issues there was a notable increase in the use of limited-obligation bonds, secured by a pledge of the proceeds of road-user taxes, the amount outstanding increasing from \$97 million to \$320 million during the 6-year period.

The study of individual issues in numerous States discloses wide variations in method and a tendency to experiment with different forms of credit financing. The toll-road movement continues vigorous; but two States, New Hampshire and New York, have taken steps to avoid the high debt-service charges associated with toll-revenue bonds by the use of general-obligation financing. Limitations on debt and the difficulties of amending State constitutions have been avoided in some States, notably Florida and Pennsylvania, by the creation of special State authorities with the power to borrow. In other States the credit of counties and cities is utilized in the development of urban expressways and controlled-access highways, by the issue of limited-obligation bonds secured by road-user taxes and other pledged revenues. Traditional methods of State highway bond financing are being used with conspicuous success in a number of States, among them Maryland and Massachusetts; but even in this field a choice is offered between limited-obligation and general-obligation bonds. North Carolina and West Virginia differ from other States in this group by using bond-issue funds to improve their secondary road systems.

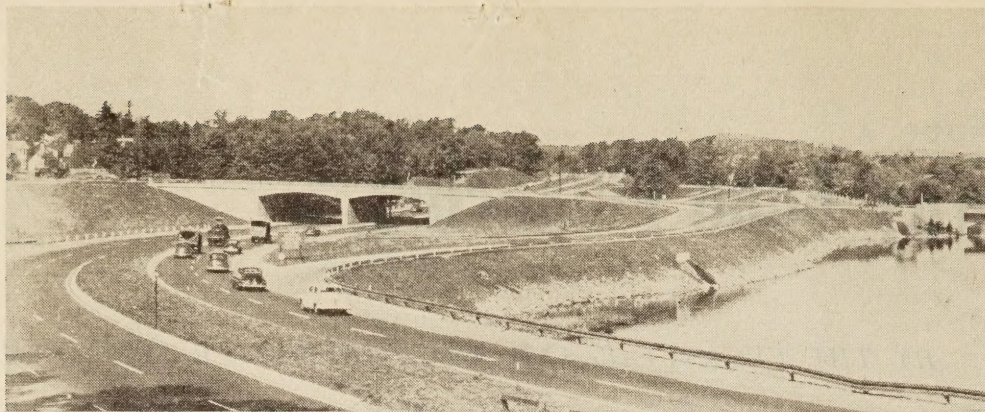
Only time and experience can show which of these diverse methods of credit financing are most suitable in the highway field. Current examples of the success of toll-free financing of major improvements, and efforts toward the prudent and economical financing of toll facilities suggest that, in the long run, the true principles of public service will prevail over any tendency to exploit the money-making potentialities of traffic demand.

HIGHWAY inadequacies and deficiencies are almost universally recognized today—by highway engineers and administrators, by motor-vehicle manufacturers, suppliers, and users, and by the public generally. A great deal has been said in recent years about highway needs. Numerous States have made careful studies of road and street requirements within their borders; these and other data have formed the basis of a number of Nation-wide estimates of highway needs—of the Interstate Highway System (1),¹ of the Federal-aid system (2), and of all roads and streets (3, 4).

A few years ago there was talk of a \$4-billion program, amounting in more exact terms to \$4,413 million (4), as the annual sum required to meet all road and street needs. This estimate, based on the concept of a program to achieve adequacy in 15 years, made use of a rather optimistic forecast of the trend of highway prices, which were expected to cascade downward toward a level 50 percent above the prewar status. Actual expenditures for all roads and streets in 1950 were \$4.27 billion, or nearly \$4.6 billion if debt retirements are included (5). Thus the \$4-billion program is at hand, but it has brought far less accomplishment than was contemplated in the original \$4.4 billion estimate.

Of late there has been little talk of declining price levels; and a figure of \$5.7 billion has emerged as the annual requirement for an adequate road and street program. That value is, in effect, the over-optimistic \$4.4-billion program converted into 1951 dollars. Not claimed to be highly accurate, it will stand as a fair indicator of the extent to which our annual achievements fall short of our highway needs.

¹ Italic numbers in parentheses refer to the list of references on page 88.



Massachusetts State Route 128 at Weston.

Difficulties in Financing

The greatest difficulties—and the widest areas of disagreement—are found in the field of highway finance. In all too many States the legislatures, or the people by popular referendum, have failed to ratify the plan for financing the engineering program of highway needs; or, by adopting half-measures, have put the improvement program on short rations. These failures, and the general Nation-wide inability to match needs with productive efforts, have caused some people to say that we are fighting a losing battle against the destructive forces and imperative demands of highway traffic. This pessimism, not to say defeatism, is unwarranted. Notable highway improvements, rural and urban, in a number of States in recent years have advanced the highway plant toward adequacy, even though not at the desired rapid rate. Two States, Michigan and Washington, have taken aggressive steps to meet the challenge of their highway needs studies. By legislative enactment (6, 7) both States have launched a double-barreled attack, providing for increased highway taxes and the use of bond issues. These are only two out of numerous examples that can be cited of bold action to meet the threat of inadequate highways. And it must be acknowledged that the toll-road movement, although in the opinion of many it is storing up problems for the future, is at least giving us some roads as of now.

A canvass of the States that have proceeded boldly to the attack on highway deficiencies will reveal the fact that the judicious use of public credit is a most potent weapon in this struggle. It is the purpose of this article to examine the recent history of credit financing of highways in the United States, with particular attention to those devices and procedures for borrowing that have found favor among the States, or give particular promise for future use. Toll-revenue bond financing by public authorities is a form of credit financing for highways and is treated as such herein, without discussion of the controversial aspects of the toll-road movement. The article is concerned with four major themes: (1) A discussion of the use of credit in public finance, in general, and with particular

reference to highways; (2) a brief historical review of highway bond-issue financing; (3) a discussion of recent developments in the field, with statistics of bonds issued, redeemed, and outstanding during the period 1945-50; and (4) consideration of the methods of borrowing employed, the progress made, and the recent experiences encountered in a number of specific States (insofar as possible, information up to June 30, 1952, is included).

A word should be said about the current situation. The stringency in steel and other scarce metals may put a damper on the highway construction program during coming months. The inflated condition of highway prices may also act as a deterrent, although up to now the urgency of need has been the compelling factor. Finally, highway borrowing, although relatively of very modest proportions, may be charged by some with contributing to the inflationary spiral, through the expansion of credit. This article is not concerned with the immediate situation, or with short-term decisions that may have to be made about particular bond issues. It is concerned with the role of highway bond financing in an economy such as we have experienced during the past few years and seem likely to have over a considerable period in the future—one of high national income, with generally expanding production and a steady increase in motor-vehicle traffic.

PRINCIPLES OF PUBLIC CREDIT

Credit, which is the power to borrow money, permits the current use of future assets. It plays an important part in daily life. Business uses credit to finance capital improvements, to facilitate day-to-day operations, and to meet emergencies. Individuals borrow to purchase homes and for other major outlays, as well as to meet emergencies. Installment credit is widely used to finance the purchase of automobiles, household appliances, furniture, and other goods. For governments, no less than for individuals, credit is a useful tool.

To meet the varying needs of ordinary private credit operations, diverse credit instruments have been developed, all of which involve the present use of or control over purchasing power in exchange for a promise to

repay the amount so used. Among these are notes, bills, letters of credit, and bonds.

Public credit is a branch or form of credit in general. It enables a governmental unit to obtain something of value by promising to pay at a later time. The promise of the borrowing unit of government may bear one or several appellations depending on the terms of the debt and local terminology. Among the more common are note, warrant, certificate of indebtedness, debenture, and bond. Note warrants, and certificates of indebtedness are usually of a shorter term than are debentures or bonds. In general investment terminology short-term obligations are called notes and long-term obligations are called bonds. This article deals primarily with public long-term obligations incurred for highway improvements; in other words, State, county, and local highway bonds.

It has been said (8) that "Since public credit is simply the use by government of a device known and used throughout the commercial world, the principles underlying government credit are not different from those that apply generally." Both public and private credit depend upon the resources and reputation of the debtor. The principal differences between public and private credit stem from the security behind the loan. In the case of public revenue bonds not backed by the full faith and credit of the issuing government, even this difference diminishes.

Prudent Public Borrowing

The circumstances under which it is prudent for a government to incur debt do not differ greatly from those under which it is proper for an individual or a corporation to borrow money. The principle that it is advisable to borrow when the use of money is more valuable at the time of borrowing than at the time of repayment holds true for governments as well as individuals. Howard (9) states the matter in these words: "If the earlier use of money is more valuable than the interest that must be paid, then, as a general rule, it is unobjectionable for the government to borrow. Indeed, it may not only be wise and prudent but also highly necessary. So far as the use of money is more valuable at a given time than its interest cost there is, then, no pronounced difference between public and private credit."

It is well to examine this principle for a moment, as it lies at the root, not only of the issuance of bonds, but of all monetary transactions. The matter at issue is the time value of money. Without entering into the basic economics, or the psychology, of interest and interest rates, we may state that money in hand is always of more value than an equal amount in future prospect. A discussion of this principle as it affects the entrepreneur is found in Baumol's *Economic Dynamics* (10).

If P_1 is defined as a certain amount of money expected at the end of a period, say a year, and P_0 is its present value (a smaller amount), we may define the interest rate as such that:

$$P_0(1+i) = P_1.$$

If P_2 is the amount in prospect at the end of the second year, having value P_1 at the end of the first year, we have:

$$P_1(1+i) = P_2; \text{ thus}$$

$$P_0(1+i)^2 = P_2.$$

By inspection it follows that if P_n is defined as an amount of money expected at the end of n years, its present value is given by the equation:

$$P_0(1+i)^n = P_n; \text{ and}$$

$$P_0 = \frac{1}{(1+i)^n} P_n.$$

If the quantity $1/(1+i)$ is defined as the discount factor D we have:

$$P_0 = D^n P_n.$$

The above is no more than a statement of the principle of compound interest; but it should be borne in mind, because there are those who maintain that interest on a government debt is merely so much money wasted. The crux of the matter lies in the advantage gained from money in hand rather than in prospect.

Value of Money in Hand

In a simple example of private enterprise, a man may wish to borrow money to build a factory, in anticipation of profits to be had from the manufacture and sale of a commodity. Since he cannot build the factory without it, money in hand is of great value to the would-be manufacturer. The capitalist, knowing the value of his money and wishing to derive an income from it, appraises the risks involved as well as the relative time values of money; and reaches an agreement with the borrower as to the rate of interest.

To a government wishing to borrow money the advantages of money in hand rather than in prospect are seldom in the form of anticipated profits, although they often have to do with the operation of public enterprises. The advantages exist, nonetheless, and they are the only reason why a governmental unit should float a loan and pay interest on it. Sometimes the advantage takes the form of relief from a dire emergency or from temporary financial embarrassment; at other times great and lasting benefit to the community is anticipated. To the latter category belong the highway bond issues with which this article is concerned.

For governments as well as individuals and corporations the proper function of credit is to serve as a supplement to current revenue. The principal of any debt, together with interest, must ultimately be paid from current revenue unless the debt is defaulted or repudiated. Although failures to repay public debt have not been unknown in American history, highway borrowings in the modern era (1890 to date) have been conspicuously free from this blight. The necessity for the repayment of loans out of taxes does, however, bring to the fore the fact that there are three parties to a public credit transaction: The governmental unit, acting in the role of man-

agement; the taxpaying public, which either directly or through legislative action, must approve the loan; and the money lenders, or investing groups.

Time Value of Money

The attitude of each of these three parties is affected by views regarding the time value of money—the value of money in hand in relation to money in prospect. The public in particular, tax conscious as it generally is, must decide whether to forego the prospective advantage altogether, to finance it out of current—and perhaps very burdensome—taxation, or to finance it by means of a loan, e. g., to make the payment out of dollars of which the present value is less than that of the dollars out of which current taxes must be paid. The governmental body, representing the public, attempts to act in its interest. The investing groups, in appraising the desirability of the proposed loan, must weigh not only the relative time values of money but also the lower risks involved in municipal as compared with industrial securities, and certain income-tax advantages to be derived from the possession of tax-exempt bonds.

Since public borrowing is, in effect, postponed taxation, the answer to the problem of when it is financially proper for a government to borrow requires consideration of the necessity or equity of distributing part of the financial burden to future taxpayers. Shultz, in his work *American Public Finance* (11), has stated: "Authorities on public finance have established four fiscal purposes which may justify governments in raising funds by bor-

rowing—to finance large emergency or irregular expenditures, to finance capital construction projects, to harmonize the divergent rhythms of current expenditures and current revenues, and to refinance existing debt. Certain nonfiscal considerations may occasionally provide supplementary justification for a government's borrowing policy." Before proceeding to an examination of the special features and attributes of borrowing for highways, it seems expedient to discuss in general terms these four accepted justifications of credit financing.

Emergency Expenditures

In the case of unforeseen or unavoidable emergencies the resort to borrowing may not only be wise and prudent; it may be inevitable. The practice of the Federal Government in financing a large part of its war expenditures by the issue of bonds is a prime example of emergency borrowing. On the State and local level, floods, earthquakes, and other disasters not infrequently occasion large expenditures which can most conveniently be covered by means of loans. State and local governments that have neglected, or have been unable to keep institutional and other facilities abreast of the needs of modern times, may find the urgent need for rehabilitation constituting an emergency justifying the resort to credit financing. The need of our highways for modernization to meet traffic demands is a special instance of this; but this category, relating as it does to public works, belongs more properly in the second of the four justifications for borrowing.



The New Hampshire Turnpike: interchange and tollhouse.

Capital Outlay

Writers on public finance (8, 9, 11) are generally agreed that capital outlays for self-supporting public enterprises are properly financed by borrowing. Such enterprises include city water departments, power authorities, irrigation developments, and, of course, highway toll facilities. (There is much current controversy about power authorities and other water-resources developments, as well as about toll facilities; but it should be observed that the arguments center about the desirability of the enterprises themselves, and not about the use of credit to finance a self-supporting enterprise.) As in the case of a private corporation issuing bonds to create or acquire property, the bonds are often technically mortgages against the property of the enterprise; but the real security behind the issue is the assurance that revenues will be more than sufficient to maintain the property and to pay interest on the bonds.

Most authorities are willing to carry the analogy a step further by sanctioning the use of public credit to finance long-lived improvements such as schools, hospitals, and other institutions, and roads and bridges—providing, of course, that the improvements will out-

last the term of the bonds. On this subject Lutz (8) has the following to say: "If the debt maturities are arranged in accordance with the probable life of the improvements, and if the bonds are always redeemed and never refunded, a case can be made out for permitting the necessary funds to be raised by means of loans. The advocates of the loan policy for such improvements will contend that the taxes required to pay interest and sinking-fund charges on the unredeemed installments of the debt would be balanced by the loss to taxpayers that would result if a very much larger tax levy were made outright in order to pay for the improvements in cash as they are constructed. If the outlay is so large that the tax would seriously retard industry and initiative this position is doubtless well taken. Credit enters as the useful and necessary supplement to current revenues for the purpose of spreading the burden over time, and so, in reality, of lightening it."

Although cautioning against the indiscriminate use of borrowing to finance all capital outlays, students of public finance are almost unanimous in agreeing that extraordinary capital outlays for improvements that will benefit future taxpayers are properly financed

by borrowing. Adherence to this concept requires that a distinction be made between ordinary continuing capital expenditures and extraordinary capital expenditures. Practically all governmental units make some capital outlays each year to provide for normal growth and to replace existing capital improvements. To the extent that such capital expenditures are an ordinary and continuing phase of governmental activities, as are expenditures for maintenance and operation, they should be provided for from current revenues. On the other hand, large capital outlays of a type which will not soon be repeated cannot always be financed from the revenues of a single year without throwing an inordinate burden on the taxpayers. If, however, such outlays are financed by borrowing, the taxes necessary to service the debt can be spread over a period of years and the increment of the construction cost in each year's levy will be too small to be irksome. Furthermore, future taxpayers who contribute towards the retirement of the construction debt will be deriving a benefit from it. Under such circumstances, borrowing for the construction of public works which are socially advantageous and productive is a proper use of public credit.

The Cyclical Budget

The issuance of short-term notes or certificates of indebtedness to balance the irregular flow of revenues in relation to disbursements is a common, although not universal, practice at all levels of government. Of greater significance is the concept of a cyclical budget which has developed in part from the depression experience. This concept (12) emphasizes "the desirability of increasing public spending and reducing taxes in hard times as measures to soften depressions and to promote economic recovery. It follows that borrowing will be called upon to close the gap between expenditures and tax receipts. * * * When economic conditions become favorable, compensatory fiscal policy will require increases in taxation and a reduction of indebtedness."

Highways participated in the counter-cyclical effort during the depression years. A number of States (among them Massachusetts, New York, and Washington) and many local units issued public-works bonds for unemployment relief, the proceeds being used in part for highway work. The Federal Government utilized its borrowing power to establish a loan and grant procedure under the Public Works Administration and for a work-relief program under the Work Projects Administration and its predecessors. Each of these agencies in its own way spent a considerable amount of money in highway work. Grants to the States through the agency of the Bureau of Public Roads were also increased, although on a nonmatching basis. These efforts, although very useful in providing unemployment relief, did not result in a major counter-cyclical effort, as they served largely to replace dwindling State and local revenues.



The Delaware Memorial Bridge.

World War II interrupted the supposedly normal cycle of depression and prosperity, causing an abrupt curtailment of highway building and other peacetime public-works expenditures in the face of tremendously increased deficit financing. During the post-war period it has been impossible to catch up with the need for highways, schools, and other public improvements because of the demands of increased population, increased industrial activity, and increased spending power. Thus the conditions favorable to the application of a cyclical-budget policy have not come into being.

Refinancing

Borrowing for refinancing embraces both refunding and conversion. These terms are not identical, although they are often used interchangeably without distinction. Generally speaking, refunding is the postponement of debt payment, while conversion is a reissuance to provide for different (usually lower) interest rates or details other than the postponement of debt maturities. Both refunding and conversion may be combined in a single operation, called by either name.

The necessity to refund may indicate poor management of the debt or the occurrence of an unforeseen emergency that threatens to interfere with amortization of the debt. A general easing of restrictions on refunding was necessary during the depression to lessen the large volume of defaults. Conversion, on the other hand, is usually employed to reduce interest rates, with a resultant saving in the costs of debt service. The burden of public debt was not greatly reduced by conversion until the occurrence of unusually low interest rates which followed the depression of the early 1930's and still persists. This situation has resulted in the exchange of new securities at lower interest rates for outstanding obligations by many corporations and governmental units.

PRODUCTIVE BORROWING FOR HIGHWAYS

The photographs illustrating this article demonstrate current activity in highway building financed out of bond issues. The pictures and their captions speak for themselves and for the States that have undertaken the work, serving as indicators of progress in the struggle for adequate highways. Many of the photographs appear through the courtesy of the State highway departments.

Of the four justifiable purposes of public borrowing discussed in the preceding section, we are concerned in the highway field chiefly with the second—borrowing for capital improvements; and largely as a corollary of this, with the first—borrowing for emergency or irregular expenditures. The road and street plant is in such a condition today with respect to the demands of traffic upon it that in many States a program of extraordinary expenditures is needed. The financing through bond issues of such an emergency program of capital outlays is thus doubly justified.



The Tacoma Narrows Bridge in Washington.

User Taxes in Relation to Credit Financing

Because of the practice of dedicating road-user tax revenues for highway purposes, highways occupy an intermediate position between the self-supporting public enterprises and entirely tax-supported activities, such as the schools. This is particularly true of State highways, which in all States are supported almost entirely by State highway-user imposts supplemented with Federal-aid funds. Even though most State highway bonds are secured by the full faith and credit of the State, the interest and principal payments on State highway bonds are almost universally made from the road-user tax receipts. It is therefore appropriate to explore the implications of viewing highways, or at least the primary highway systems, as governmental enterprises supported by charges upon the users. Upon this basis the proposal for improvement by credit financing of a system or group of roads would be justified if the revenues generated or "earned" by the traffic on the particular group of roads will be sufficient, or more than sufficient, to defray the debt service charges and the costs of maintenance and operation.

The idea that bonds issued to finance arterial highway improvements should be secured by a pledge of their annual earnings in road-user taxes has been advanced by a number of authorities (13, 14, 15). In calculating such earnings the ordinary procedure is to evaluate the traffic on a given road or group of roads in terms of the annual amount of motor-fuel tax revenues generated, by the use of reasonable values of miles per gallon for the different types and sizes of vehicles of which the traffic is composed. To this may be added a pro rata of annual registration fees and miscellaneous motor-vehicle receipts. Other available revenues, including Federal

aid, should be accounted for in the calculations.

Not everyone would agree that the earnings of specific highways or groups of highways should be pledged to the service of bonds issued for their improvement, although the more generalized dedication of road-user tax revenues for debt service on State highway issues is the common practice. Perhaps a more pertinent procedure, with respect to any proposed highway bond issue, is to determine at what rate of user taxation (together with other available revenues) the facilities to be improved will generate sufficient revenues to pay off the issue and provide for maintenance and operation.

Highway Toll Facilities

Toll roads and bridges are, or purport to be, supported by their toll revenues plus any additional income, such as receipts from concessions, that may be provided for. This being the case, they fall into the category of self-supporting public enterprises. It is not intended here to enter into the controversy regarding the modern toll-road movement. It may be noted, however, particularly in the case of toll roads, that a higher rate of interest or, to be more exact, a higher yield is generally exacted by the investors than in the case of ordinary highway bond issues. With some exceptions, the faith and credit of the State is not pledged, and State user-tax revenues are not available for debt service. With the toll revenues in effect the only security, an element of greater risk is recognized in the higher yield.

Conditions Favorable to Bond Financing

It is an accepted principle of public finance that capital outlays for replacements and to

Table 1.—Bond-issue proposal for the State of Ohio¹

<i>Program period:</i>	
January 1, 1953, to December 31, 1972; bonds issued in 10 equal annual installments, starting July 1, 1953, and retired in 10 equal annual payments starting July 1, 1963.	
<i>Requirements:</i>	
State system 10-year program cost.....	\$1,838,560,000
Accomplishments to Dec. 31, 1952.....	100,000,000
Net total program cost.....	1,738,560,000
Net annual requirements, State system.....	173,856,000
<i>Evaluation of required bond issue for State systems:</i>	
<i>B</i> = amount of required bond issue.	
<i>E</i> = required annual expenditure, exclusive of interest on bond issue = \$173,856,000.	
<i>i</i> = annual interest rate, assumed at 2 percent.	
<i>I</i> = average annual interest payment, 1953-62 = $\frac{B}{2}i = 0.01B$.	
<i>R</i> = average annual revenues available = \$119,249,000.	
$R + \frac{B}{10}$ = average annual income, 1953-62.	
<i>E</i> + <i>I</i> = required average annual expenditures, 1953-62.	
$R + \frac{B}{10} = E + I$.	
Substituting, $\$119,249,000 + \frac{B}{10} = \$173,856,000 + 0.01B$.	
Thus, $B = \$603,744,000$ = required bond issue.	
<i>Transactions of second 10 years, 1963-72:</i>	
Average annual expenditures, exclusive of debt service, 1963-72.....	61,908,000
Annual retirements.....	60,674,000
Average annual interest requirements.....	6,067,000
Average total requirements.....	128,649,000
Average annual revenues for State systems, 1963-72.....	135,745,000
Average annual surplus.....	7,096,000

¹ Source: Bertram H. Lindman, *Supplemental Bond Financing for Acceleration of the Ohio Highway Program*, March 1951 (prepared for the Ohio Program Commission), p. 28.

meet the needs of normal expansion should be met from current revenues rather than from borrowing. Capital outlays for highways are needed each year to replace or reconstruct worn out highways and to provide for normal increases in traffic. Such continuing capital outlays are properly a current expense, like maintenance and administration, and should be provided for from current revenues. Prolonged contraction or interruption of this process of replacement and improvement, however, will inevitably result in the accumulation of a backlog of needed construction. If the additional expenditures required to remedy the accumulated deficiencies are too great to be provided from current revenues within a reasonable time, the situation is an emergency warranting resort to borrowing. Even if the cost can be met by a long-term current-revenue program, shortening the time required for rehabilitation and modernization by credit financing is a proper and justifiable use of public credit, provided the benefits from earlier improvement are at least equal to the interest costs incurred.

It is needless to labor the point that we are in just such a situation today. With an accumulated backlog of needed improvements inherited from the war years and increasing each year with the mounting demands of traffic, the need for an accelerated highway program is recognized in almost every State. The rate of highway expenditure can be accelerated by an increase in highway taxes; and this is what should be done if the intention is simply to move to a higher level of normal expenditures. A truly accelerated program, however, contemplates a short period of abnormally high capital-outlay expenditures, during which the highway plant will progress rapidly toward a condition of adequacy. Such a program can best be financed by a bond issue.

The advantages to be derived from such an accelerated program lie in the reduction of vehicular operating costs, including a reasonable assignment of values to time costs, of accidents and their costs, and of the strains and discomforts of driving over inadequate highways. Since all of these benefits will be realized at earlier dates under an accelerated program, their accumulated values over a given time will be much greater than under a long-term current revenue program.

The design of a highway improvement program should be selective. Credit financing is best adapted to facilities having a relatively long investment life. For that reason, and also because of the urgency of need, it is natural to plan first for the use of bond issues in the construction of arterial improvements, both rural and urban. Close study, however, may reveal that the improvement of other systems may advantageously be financed out of bond issues.

Credit Versus Pay as You Go

The choice between credit financing and "pay-as-you-go" (which may well be called "pay-before-you-go") is essentially a choice as to the rapidity with which the desired capital

improvements will be made. The increased costs, if any, of credit financing must be weighed against the benefits that will be derived from earlier completion of the project or program. As Howard (9) puts it: "One misstatement, repeated again and again, is that in return for the principal only, the Government pays back the principal plus interest. This is a reprehensibly incomplete statement of the facts. The Government obtains the principal at the beginning of the transaction, plus the use of other people's money throughout the term of the bonds, in return for which it pays the interest during the period of the loan plus the principal at the end of the term. The use of other people's money is as valuable as, or presumably more valuable than, the interest paid for that use; otherwise the money would not be borrowed."

Credit financing does not, however, inevitably increase the cost to the governmental unit (and therefore to the taxpayers) by the amount of the interest costs incurred. Under a "pay-as-you-go" program of highway improvement extending over a long period of time, some sections of road will require temporary or stop-gap improvements while awaiting final improvement to the desired standards. An accelerated program of improvement made possible by borrowing may, under certain conditions, reduce the amount of stop-gap and temporary improvements enough to offset part or all of the interest cost.

Bertram H. Lindman, who acted as consultant to the Ohio highway fiscal and tax study in 1950-51, suggested the possibility that the 20-year highway improvement program recommended for all roads and streets in that State could be modified by introducing a 10-year bond-issue program for the State

A and B systems (rural and urban) and retiring the issue during the second 10 years without increasing the annual revenue requirements of the total road and street program. At Mr. Lindman's request, calculations were made at the Bureau of Public Roads to test the idea; and these calculations, subject to the soundness of the given data, confirmed the validity of his suggestion. His findings and the supporting calculations were subsequently published by the Ohio Department of Highways (16).

A key figure in the analysis was supplied by the engineering consultants for the Ohio highway needs study, who estimated that the annual requirements (construction, maintenance, and administration) of the State A and B systems, which would amount to nearly \$184 million during the 10-year bond-issue program, would drop to less than \$62 million during the second 10 years. Table 1, taken from the Lindman bulletin, gives the essential steps in the calculations made in connection with this unusual proposal. It will be observed that a bond issue of about \$607 million is required; and that it is retired, with interest at 2 percent, during the second 10-year period, with a \$7-million average annual surplus of revenues over requirements.

The Ohio calculations illustrate one of the possible dangers of too-great reliance on credit financing. The greatly accelerated program would produce a profound lull in construction activities in the second 10 years during which replacement needs would very slowly accumulate. Such a great discontinuity in construction activity might be objected to on the ground that it would disrupt both the staff of the State Department of Highways and the contractors' organizations

program actually prepared for adoption could probably be less drastic in this respect. This factor of discontinuity is, however, a practical consideration which in the absence of other restraining factors would tend to set a limit on the extent of an accelerated bond-issue program.

HISTORICAL BACKGROUND²

In America the earliest public borrowing was done by the English colonial governments. These loans were primarily to provide funds for current expenses and to supply a circulating medium. Borrowings to obtain funds for capital outlays were of minor importance. During and after the Revolution the State governments, successors to the colonial governments, borrowed for both war and civil current expenses. After ratification of the Constitution and the establishment of the Federal Government the States discontinued further borrowing and, although a few States negotiated bank loans during the War of 1812, large-scale borrowing was not begun until the 1820's.

Early Borrowing for Internal Improvements

The early State debts were almost entirely in the form of paper money and certificates. Many were, in effect, forced loans. With the advent of borrowing for internal improvements in the 1820's, State bonds made their appearance in the investment market, marking the beginning of State debts as they are known today. State borrowings for permanent improvements began in this country some time after 1820; and by 1838 the States had issued \$175 million of bonds to construct or

² Much of the historical background cited here was obtained from references 11, 17, 18, and 19.

subsidize canals, turnpikes, railroads, banking, and other ventures, of which about \$10 million were for turnpikes.

The panic of 1837 brought an abrupt end to the States' borrowing for such internal improvements and in the early 1840's nine States (Arkansas, Florida, Illinois, Indiana, Louisiana, Maryland, Michigan, Mississippi, and Pennsylvania) defaulted and four others (Alabama, New York, Ohio, and Tennessee) barely avoided it. Previous to 1840 no State constitution limited the debt which the legislature might incur, but the crisis years of the 1840's brought about a natural and expected reaction and, by 1857, 19 States had adopted constitutional limitations on borrowing. These amendments were part of a general movement by the voters to withdraw some of the powers liberally granted to legislatures by early constitutions. Debt limits were usually included in the constitutions of States admitted to the Union after the Civil War.

Renewed demands for State aid to internal improvements accompanied the improvement in business conditions and the recovery of State credit, and a second, but smaller, borrowing boom was under way by 1850. During this period none of the States which defaulted in the 1840's participated; only Southern and Western States (and New York) borrowed; borrowing was largely for railroads; and the borrowing was slower and more cautious than in the 1820's and 1830's. Except to issue bonds for war purposes during the Civil War, the States borrowed little during the remainder of the nineteenth century. By 1900 only a little over \$12 million of State highway bonds had been issued. Beginning in 1890 Idaho had issued about \$200,000, and Massachusetts, beginning in 1893, had issued the remainder. By 1912 the States had issued \$67 million of highway bonds.

Historical data concerned with the borrowing habits of the counties and other local

rural units for highway purposes are not readily available. It has been estimated that in 1870 the counties had a total net debt outstanding of \$188 million. It is believed that very little of this debt was for highway purposes. As nearly as can be estimated these units had highway bonds of approximately \$10 million outstanding at the turn of the century. They increased their rate of borrowing rapidly, and by the end of 1912 had issued approximately \$200 million in highway bonds.

The urban units of the United States, as nearly as can be ascertained, entered the credit financing field around 1830. By 1840 it has been estimated that the total municipal indebtedness for all purposes was \$20 million. Municipal debt mounted rapidly through the next two decades and by 1860 was estimated at \$200 million.

The decade following the Civil War was an era of great industrial expansion and the urban units borrowed heavily to finance various enterprises in an effort to keep pace with private enterprise. They subscribed freely for railroad stock and borrowed on a large scale for paving, sewer, and water-supply improvement. By 1880 the urban units were in debt to the tune of \$725 million—three times that of the States. How much of this indebtedness was incurred for street purposes is unknown, but it was undoubtedly a fairly substantial amount.

Borrowing for Highways

The advent of the motor vehicle brought a demand in the early part of the twentieth century for improved roads on which to use this form of personal transportation. Improved highways, in turn, increased the demand for private motor vehicles and permitted development of the motor-vehicle transportation industry. Thus, the motor vehicle and the highway on which to operate it are complementary and development of each increases the demand for the other.

Borrowing for State highways since 1921 has been characterized by two periods of relatively large-scale activity. The first coincided with the large road-building program of the 1920's when many States borrowed heavily for original State highway construction or assumed large debts of counties and other local governmental units in return for roads incorporated into the State system. The depression and war periods saw a lessening of borrowing, although during the early 1930's further State assumption of local debt, and revenue bonds used to finance the construction of large toll facilities, raised the total outstanding debt for State highways in 1938 to what remained an all-time height until 1951. Borrowing since 1946 has resumed the same upward trend exhibited during the 1920's.

Relation to State Construction

The relation of State borrowing to the total State highway construction program since 1920 is shown in table 2 and figure 1, which



Construction of the airport interchange in Maryland: Baltimore-Washington Expressway.

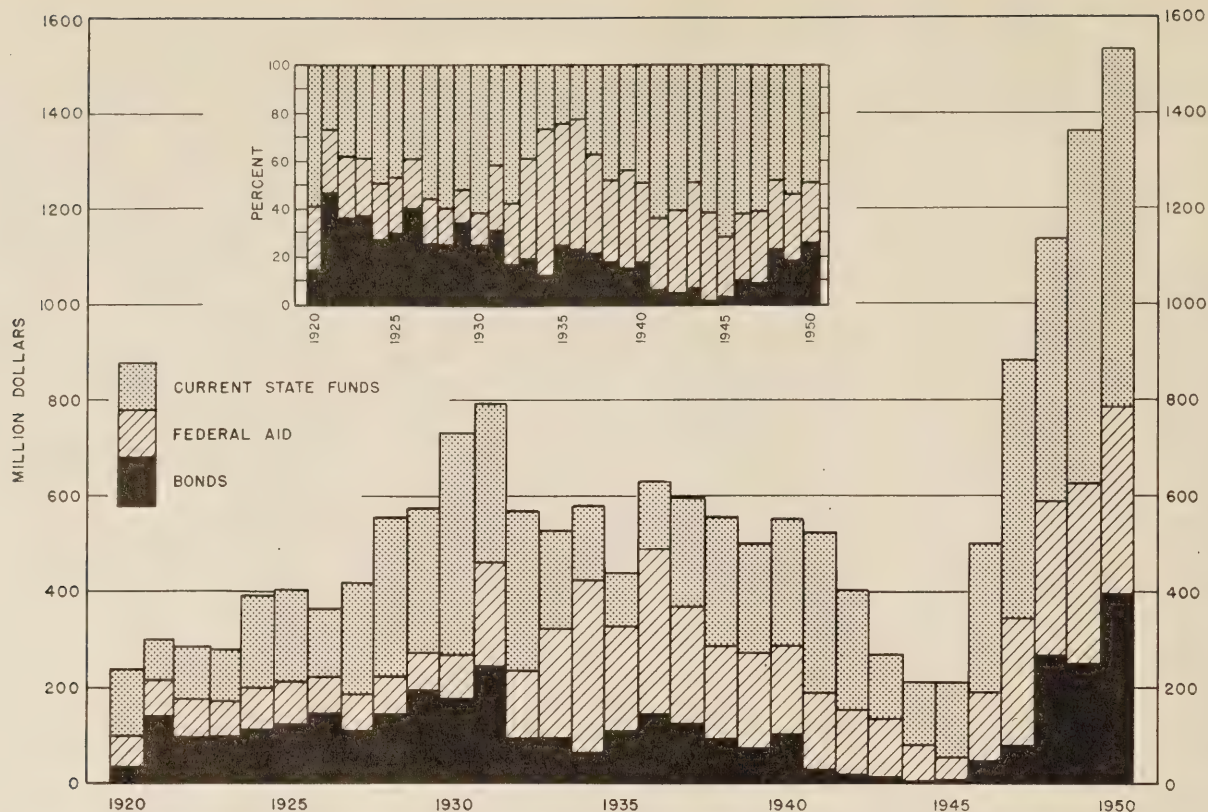


Figure 1.—Cost of State highway construction analyzed by source of funds, 1920–50.

depict three sources of revenue principally used for State construction: proceeds of bonds, Federal-aid, and current State funds.

Table 2.—Source of construction funds for State highways, 1920–50¹

Year	Construction bonds issued ²	Federal funds received	Current funds used	Total construction expenditures
	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars
1920	36,607	61,966	141,767	240,340
1921	139,915	77,741	82,953	300,609
1922	96,802	79,741	110,918	287,461
1923	98,167	73,308	108,518	279,993
1924	107,398	92,970	197,280	397,648
1925	120,672	92,343	190,828	403,843
1926	142,684	79,163	144,164	366,011
1927	106,229	80,160	232,431	418,820
1928	142,338	81,252	334,891	558,481
1929	197,434	77,952	300,089	575,475
1930	179,252	94,111	455,524	728,887
1931	242,974	218,383	335,545	796,902
1932	98,197	138,857	332,457	569,511
1933	97,919	223,586	205,507	527,012
1934	66,583	354,812	158,974	580,369
1935	109,828	219,381	109,097	438,306
1936	145,263	346,281	140,216	631,760
1937	124,654	245,749	218,839	589,242
1938	97,767	189,908	270,704	558,379
1939	75,552	202,714	221,847	500,113
1940	102,119	185,192	269,820	557,131
1941	30,641	160,526	334,066	525,233
1942	20,475	136,266	244,953	401,694
1943	18,160	119,254	131,281	268,695
1944	3,000	77,379	129,949	210,328
1945	6,500	53,145	150,822	210,467
1946	51,378	139,025	311,913	502,316
1947	79,917	262,474	539,960	882,351
1948	265,932	324,802	547,940	1,138,674
1949	248,937	377,943	735,070	1,361,950
1950	397,569	385,191	751,099	1,533,859

¹ Adapted from Public Roads tables SF-201, SF-202, SF-3, and SB-202.

² Includes bonds of the local units which were assumed by the States in the same year the bonds were issued.

This is not the whole story, however, as the current funds in the earlier years include contributions from the counties and other local units, largely from their own bond issues, for State highway construction.

Throughout the period from 1921 to 1930 proceeds of bonds contributed from 25 to 47 percent of all State construction funds. For the 10-year period bond proceeds amounted to 31 percent of aggregate funds expended for construction. In several States more than half of all construction funds represented bond issues. For example, in North Carolina the entire State highway development program was based on a bond authorization of \$115 million. This program resulted in the modernization of the State's highway system in the decade ending in 1930 when 3,500 miles of road were paved for the first time. The bonds issued were backed by the full faith and credit of the State and accounted for 70 percent of all money expended on highway construction during the decade.

Similarly, Illinois and Missouri utilized productive borrowing to accelerate their highway-development programs. In Illinois two bond authorizations totaling \$160 million contributed 60 percent of all construction funds from 1921 to 1930. Missouri borrowed \$135 million in a similar period and greatly accelerated its highway development. Numerous other States issued bonds during this period, and still others utilized the credit of the counties and other local units in the construction of what became their State highway systems.

The decade from 1931 to 1940 produced borrowing at a slightly lesser rate, even

though there were large assumptions of local debt and huge revenue issues for such facilities as the San Francisco bridges and the Port of New York Authority's bridge and tunnel program during this period. Federal aid assumed a dominant role in financing during the depression years with increased authorization for work programs. During the period 1931–40, Federal funds accounted for 40 percent of all construction moneys while bond proceeds contributed one-fifth of all construction funds.

From 1941 to 1950, there were two contrasting developments—the cessation of normal highway construction during World War II; and the postwar construction boom, characterized by a rapid increase in highway borrowing.

The fact that borrowings were used extensively in meeting the urgent and vociferous demand for improved roads that permitted and accompanied the development of motor vehicle transportation is not surprising. Public revenues from traditional sources, principally the property tax, were not capable of expanding rapidly to meet the demands of this new form of transportation, and the newly adopted highway-user taxes could develop an important source of revenue only as improved highways permitted realization of the increasing desire for motor-vehicle ownership and use. There is no doubt that the judicious use of credit financing during the early period of modern highway transportation not only resulted in savings to vehicle operator through reduced operating costs, but also accelerated the growth of highway transportation. Quoting Edna Trull (20): "There wa

adequate justification, moreover, for this type of financing. The immediate benefits of facilitating communications and providing economies in transportation were obvious, and the improvements were expected to have long-term value."

Total Borrowing for Highways

Figure 2 shows the sale of bonds for highway purposes by the States and by the counties and other local rural units in each 5-year period from 1901 to 1950. Table 3 gives the amounts of State highway bonds and of local rural highway bonds issued in each year from 1901 through 1950.

Similar information is not available for the incorporated places: Street finance data were not compiled in segregated form until the mid-1930's when the highway planning surveys in the various States started collecting such information. The net street debt of the urban units, as reported in the fiscal

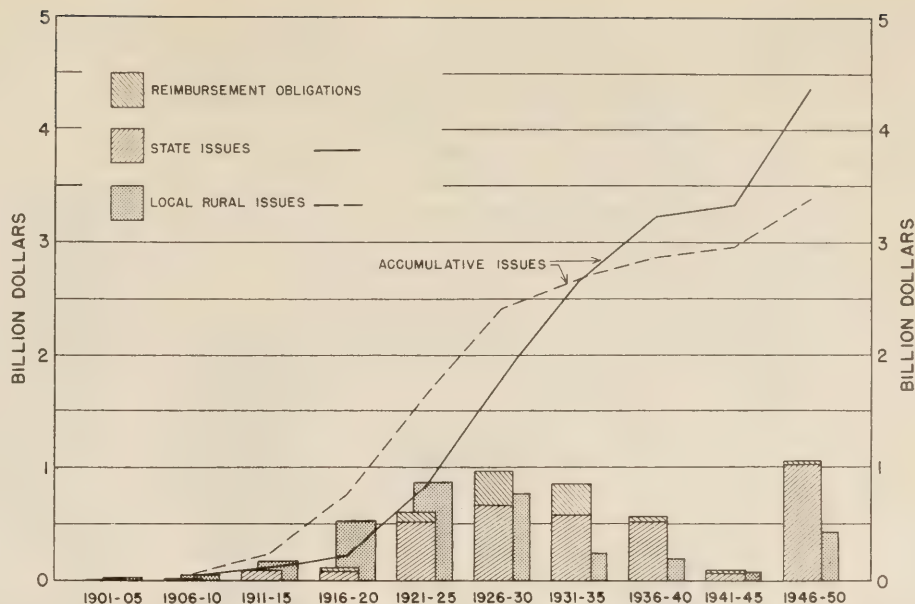


Figure 2.—Highway bonds issued by the States and local rural units, 1901-50.

Table 3.—Highway bonds issued by the States and local rural units, 1901-50¹

Year	State highway bonds			Highway bonds issued by counties, towns, townships, etc.
	Original issues	Reimbursement obligations assumed	Total	
	<i>1,000 dollars</i>	<i>1,000 dollars</i>	<i>1,000 dollars</i>	<i>1,000 dollars</i>
1901	350	-----	350	2,245
1902	900	-----	900	1,947
1903	605	-----	605	3,441
1904	450	-----	450	4,638
1905	450	-----	450	3,914
1906	1,036	-----	1,036	2,996
1907	2,042	-----	2,042	6,650
1908	6,095	-----	6,095	9,124
1909	7,185	-----	7,185	21,970
1910	6,846	-----	6,846	11,367
1911	14,214	-----	14,214	18,541
1912	13,366	-----	13,366	22,672
1913	28,759	-----	28,759	35,965
1914	11,684	-----	11,684	44,285
1915	25,319	-----	25,319	53,513
1916	4,809	-----	4,809	79,731
1917	20,835	38	20,873	58,170
1918	7,029	54	7,083	35,299
1919	32,939	683	33,622	227,892
1920	33,778	3,894	37,672	128,861
1921	130,393	20,234	150,627	223,446
1922	86,050	18,164	104,214	182,626
1923	90,636	14,986	105,622	143,543
1924	97,935	27,062	124,997	157,089
1925	117,905	5,174	123,079	167,211
1926	138,121	31,706	169,827	184,723
1927	92,886	92,164	185,050	191,851
1928	118,352	25,476	143,828	169,361
1929	175,048	114,170	289,218	123,429
1930	147,964	32,301	180,265	105,318
1931	227,477	123,729	351,206	92,511
1932	95,015	107,891	202,906	62,717
1933	96,279	26,539	122,818	17,582
1934	66,283	3,592	69,875	38,179
1935	99,269	12,129	111,398	38,679
1936	136,717	10,013	146,730	49,486
1937	110,771	18,625	129,396	46,722
1938	93,101	13,989	107,090	49,010
1939	73,514	3,560	76,874	34,548
1940	100,884	8,190	109,074	20,090
1941	29,709	4,456	34,165	31,401
1942	20,475	3,970	24,445	18,861
1943	18,160	5,419	23,579	5,536
1944	3,000	37	3,037	5,892
1945	6,500	4,397	10,897	22,184
1946	51,378	3,150	54,528	49,207
1947	78,550	1,486	80,036	106,197
1948	265,614	2,458	268,072	85,826
1949	248,537	5,525	254,062	98,559
1950	396,101	4,023	400,127	104,342

¹ Refunding bonds not included.

studies prepared by the highway planning surveys, amounted to \$1.5 billion in 1935. By 1945 the gross street debt outstanding was estimated to be \$1.2 billion. Since that time it has increased until at the end of 1950 it is estimated to have again reached \$1.5 billion.

The accumulated borrowings from 1901 to the end of each 5-year period are also indicated in figure 2. The outstanding debt, which is not shown on the chart, is much less than the accumulated borrowings, of course. At the end of 1950, the outstanding highway debt of the States was \$2,141 million and that of the counties and other local rural units was \$904 million. Despite heavy borrowings during 1946-50, the outstanding State debt is less than half the total amount issued since 1900, and outstanding debt of the counties and other local rural units is but little more than one-fourth of the total amount issued since 1900.

It is not surprising that the ratio between the debt outstanding at the end of 1950 and the total debt issued since 1900 is smaller in the case of the counties and other local rural units than in the case of the States. The bulk of the county debt was incurred earlier than was the bulk of the State debt and, therefore, much more of it has matured and been retired. It is of interest to note that the two cumulative curves cross in the mid-1930's. During the early years county and local issues dominated the field, and only gradually gave ground to the mounting total of State highway bond issues.

Reimbursement Obligations

During the early years of highway development, the counties and other local rural units borrowed both for local roads under their jurisdiction and for intercommunity roads which were then, or later became, State highways. As State highway departments were created and the States assumed more financial responsibility for the more important through

highways, State borrowings increased. Also, some States undertook to reimburse the local units for their contributions to the cost of State highways. These pledges or reimbursement obligations are segregated from State bond issues in figure 2.

In general, reimbursement obligations are of two kinds: pledges by the State to pay principal and/or interest charges on local road obligations issued for State highways; and pledges by the State to refund to the local road authorities certain specified amounts over a period of years. The circumstances surrounding the assumption of reimbursement obligations vary from State to State. In some States—among them Iowa, Minnesota, South Carolina, and Wisconsin—the counties were encouraged to issue bonds and turn the proceeds over to the State with the understanding that the State would provide funds for the payment of principal or principal and interest on the bonds. The State thus used the credit of the local governments to borrow for State highways. This practice was followed in Iowa as late as 1941 and is still followed in Wisconsin. Neither of these States has any direct State debt for highways.

In other States—as in Arkansas, Kansas, and Texas—no commitment was made, at the time of the local contribution, to reimburse the local units, but later the State assumed this obligation. In some other States, among them Tennessee, the circumstances leading to the assumption of reimbursement obligations partook of both of the situations described above. In almost all cases, reimbursement obligations stem from inability or reluctance on the part of the State to assume complete financial responsibility for main highways during the early days of highway development, or to incur debt. In some cases the actual assumption of reimbursement debt was spurred on by the economic plight of local governments during the early 1930's. Although during the last two decades the States

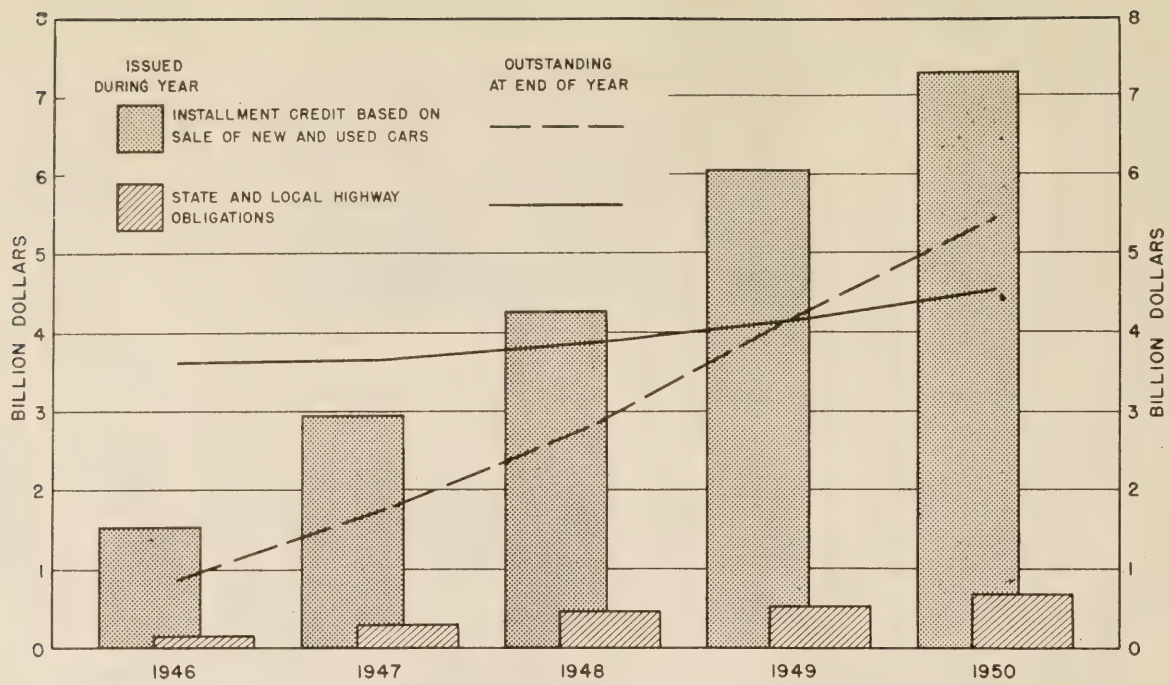


Figure 3.—Borrowings for passenger cars and for highways.

have assumed the dominant role in borrowing for rural roads, both State and local borrowings played an important part in the early years of highway development by helping to meet the emergency created by the demands of the rapidly growing motor-vehicle transportation industry for better roads.

Need for Modernization

The years since the end of World War II have brought many problems similar to those encountered during the early years of highway development.

The drastic curtailment of construction and the reduction, because of increasing price levels, in the effectiveness of maintenance expenditures during the years of World War II did much to hasten the deterioration and obsolescence of our highway systems. The demand for motor-vehicle transportation, frustrated during the war years, appears to be far from satiation. Motor-vehicle registrations and use are now increasing rapidly. Expensive highway improvements are urgently needed to serve the increasing traffic. Unfortunately, the vehement demands of high-

way users for highway improvement and modernization are not always matched by their willingness to pay for the improvements through increased taxes.

The magnitude of the problem facing the highway administrator is indicated by the estimate that the 1950 rate of construction was roughly 60 percent of the rate required to meet total highway needs over a 15-year period (21).

Much has been accomplished in spite of the skyrocketing costs of construction and maintenance. Maintenance, administration, general overhead costs (including that of highway police), and interest have taken almost 50 percent of the \$16¼ billion of current revenues available for highway purposes in the period 1946-50, with maintenance alone requiring 37 percent.

It is true that revenues have increased tremendously in recent years, but the increase has not been proportionate to the combination of offsetting factors—increased registrations, increased travel, and increases in construction and maintenance costs. The lack of sufficient revenue is partially caused by the inflexibility of the highway-user tax struc-

ture. To be sure, revenues increase as registrations and travel increase and gasoline taxes have been raised in a number of States; but the increase in revenues has not kept pace with the increase in highway costs. For example, from 1940 to 1950 gasoline-tax rates increased only 12.7 percent; yet during the same period unit prices for road construction increased 97 percent and those for maintenance 87 percent. A drastic increase in road-user taxes is not necessarily the best remedy. Many highway administrators are finding that resort to credit financing, together with the assurance of highway revenues adequate to service the debt and meet other highway needs, offers an advantageous solution to their most pressing highway problems.

Credit Financing of Motor Vehicles and Highways Compared

A rather interesting, although unorthodox, comparison can be made between highway bond financing and the use of installment credit to finance the rolling stock of our highway transportation system. The value of new and used vehicles sold in 1948 exceeded \$14 billion, of which new and used passenger cars accounted for more than \$12 billion. It is reported that 39 percent of all new and used car sales in 1948 involved credit transactions, and that the volume of installment credit was nearly \$4.3 billion. In 1950 the volume of installment credit was \$7.3 billion. In table 4 and figure 3 the amount of installment credit extended on the sales of new and used passenger cars and the amount outstanding at the end of the year are compared with the total State, county, and municipal long-term highway obligations issued and outstanding, for the postwar years 1946-50.

Although the comparison of short-term installment credit with long-term highway debt

Table 4.—Total highway bonds issued and outstanding, and installment credit on passenger cars extended and outstanding, 1946-50

Year	Installment credit extended on new and used passenger cars during year ¹	Total highway bonds issued during year	Installment credit outstanding at end of year on new and used passenger cars ¹	Total highway debt outstanding at end of year
	Million dollars	Million dollars	Million dollars	Million dollars
1946.....	1,535	168	878	3,615
1947.....	2,951	308	1,733	3,655
1948.....	4,277	475	2,757	3,899
1949.....	6,031	531	4,129	4,215
1950.....	7,310	704	5,440	4,557

¹ Board of Governors of the Federal Reserve System, quoted in Automobile Facts and Figures, 1951.

Table 5.—The Bond Buyer's index of the municipal bond market (20 bonds)

Year	Index of yield ¹	Year	Index of yield ¹
1900	3.25	1926	4.23
1901	3.10	1927	4.13
1902	3.18	1928	3.87
1903	3.30	1929	4.17
1904	3.40	1930	4.23
1905	3.48		
		1931	4.12
1906	3.53	1932	4.87
1907	3.67	1933	4.61
1908	3.87	1934	5.48
1909	3.76	1935	3.81
1910	3.91		
		1936	3.25
1911	3.98	1937	2.62
1912	4.01	1938	3.16
1913	4.45	1939	2.78
1914	4.16	1940	2.59
1915	4.26		
		1941	2.14
1916	4.08	1942	2.24
1917	4.62	1943	2.17
1918	3.92	1944	1.77
1919	4.44	1945	1.62
1920	4.56		
		1946	1.42
1921	5.06	1947	1.85
1922	4.38	1948	2.36
1923	4.16	1949	2.19
1924	4.37	1950	2.07
1925	4.16	1951	1.66

¹ The yield is the average for the year for the years 1904-14, as of the first of January for the years 1915-45, and as of the first Thursday of January for the years 1946-51.

is somewhat defective, it does point up the tremendous relative volume of financial activity in the passenger-car installment-credit field. It is also notable that installment debt outstanding has increased rapidly in comparison with the more moderate increase in highway debt, with the result that installment credit outstanding exceeded highway debt by nearly \$1 billion at the end of 1950. These facts lead to the reflection that if owners of passenger cars have the financial ability and willingness to contract and retire such a tremendous volume of short-term obligations for vehicles, then the retirement of obligations incurred for highways, spread over a number of years, should not prove difficult.

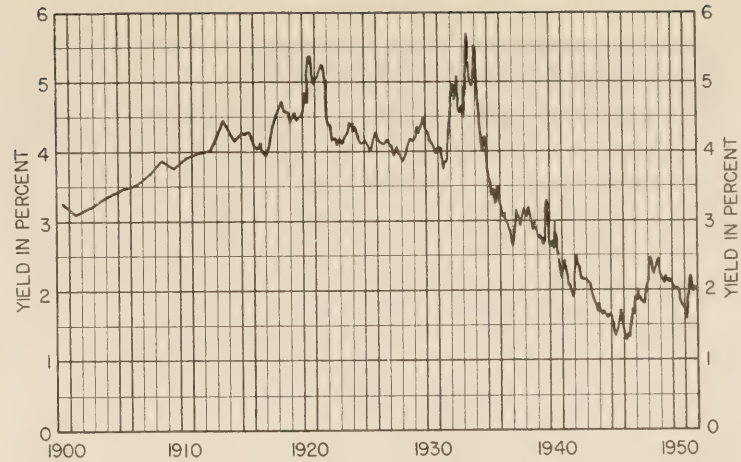


Figure 4.—The Bond Buyer's index of the municipal bond market.

Interest Rates

Low interest rates in recent years have made it possible for the State and local governments to borrow at a considerably less interest cost than was possible in the early years of highway development. In general, the price which a government must pay in the form of interest to induce investors to loan funds includes not only the pure interest cost for the use of the money but also an additional charge for insurance, or reimbursement for risk.

In addition, the price will be affected by the relation existing at any given time between the amount of money available for investment in such loans and the amount sought by potential borrowers, and by the income-tax position of the securities offered. The confidence in the security of State and local highway bonds that has been built up in the minds of investors during the last 50 years has, by reducing the increment of interest

charged for risk, contributed to the reduction in total interest costs. The fact that interest on State and municipal bonds is exempt from taxation under the Federal income-tax law, with the high rates on large incomes that have prevailed in recent years, has also been a contributing factor. However, the reduction in pure interest demanded by investors for the use of money has undoubtedly been the most important influence.

Values of *The Bond Buyer's* index of the municipal bond market are given in table 5 and shown graphically in figure 4. This index of calculated yields is the result of averaging the market value, expressed in "basis," of general obligation bonds of selected States and incorporated places. Changes in the bonds used in compiling the index are made from time to time because of trading inactivity in certain included bonds and in order to make the index more truly representative of the municipal market generally.

According to *The Bond Buyer* (22), specific issues are not used in compiling the index. Basis prices used are those applicable to a bond having a maturity of about 20 years and selling at a price close to par, with few exceptions. The average rating of the 20 bonds used in the index falls midway between the four top groups as classified by recognized rating agencies.

While the index is given by years in table 5, it will be noted in figure 4 that annual values are plotted for 1901-14, quarterly values for 1915 and 1916, and monthly values for 1917-51.

Table 6.—Gross highway debt outstanding, 1945-50 ¹

Year	State	Counties and other local rural units	Urban places	Total
	<i>Million dollars</i>	<i>Million dollars</i>	<i>Million dollars</i>	<i>Million dollars</i>
1945	1,638	869	1,223	3,730
1946	1,571	837	1,207	3,615
1947	1,537	864	1,254	3,655
1948	1,735	866	1,298	3,899
1949	1,928	885	1,402	4,215
1950	2,141	904	1,512	4,557

¹ The values given include the debt of highway toll authorities.

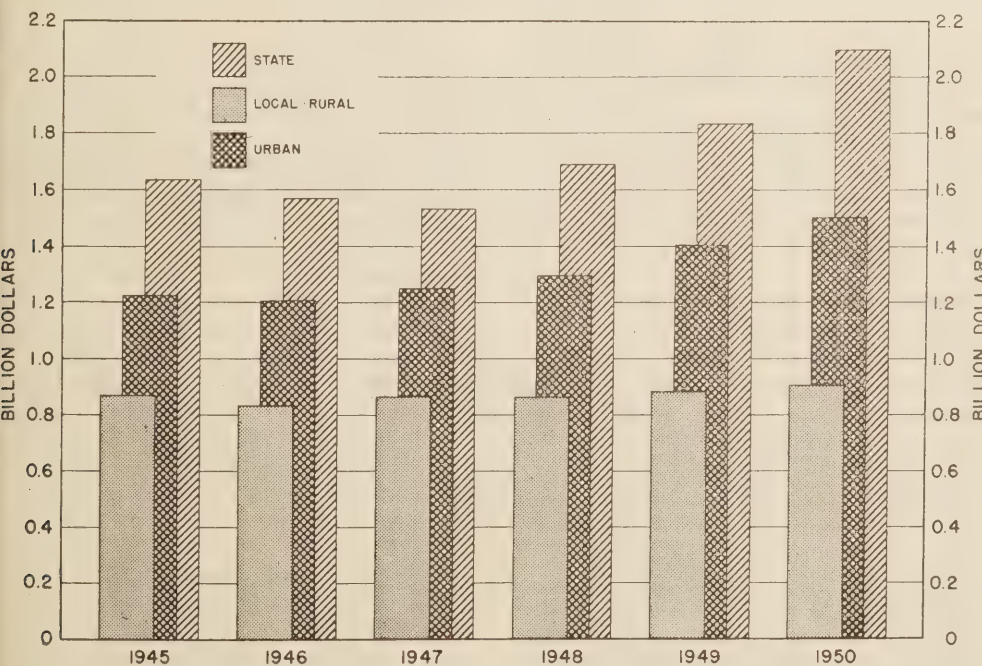


Figure 5.—Gross highway debt outstanding, 1945-50.

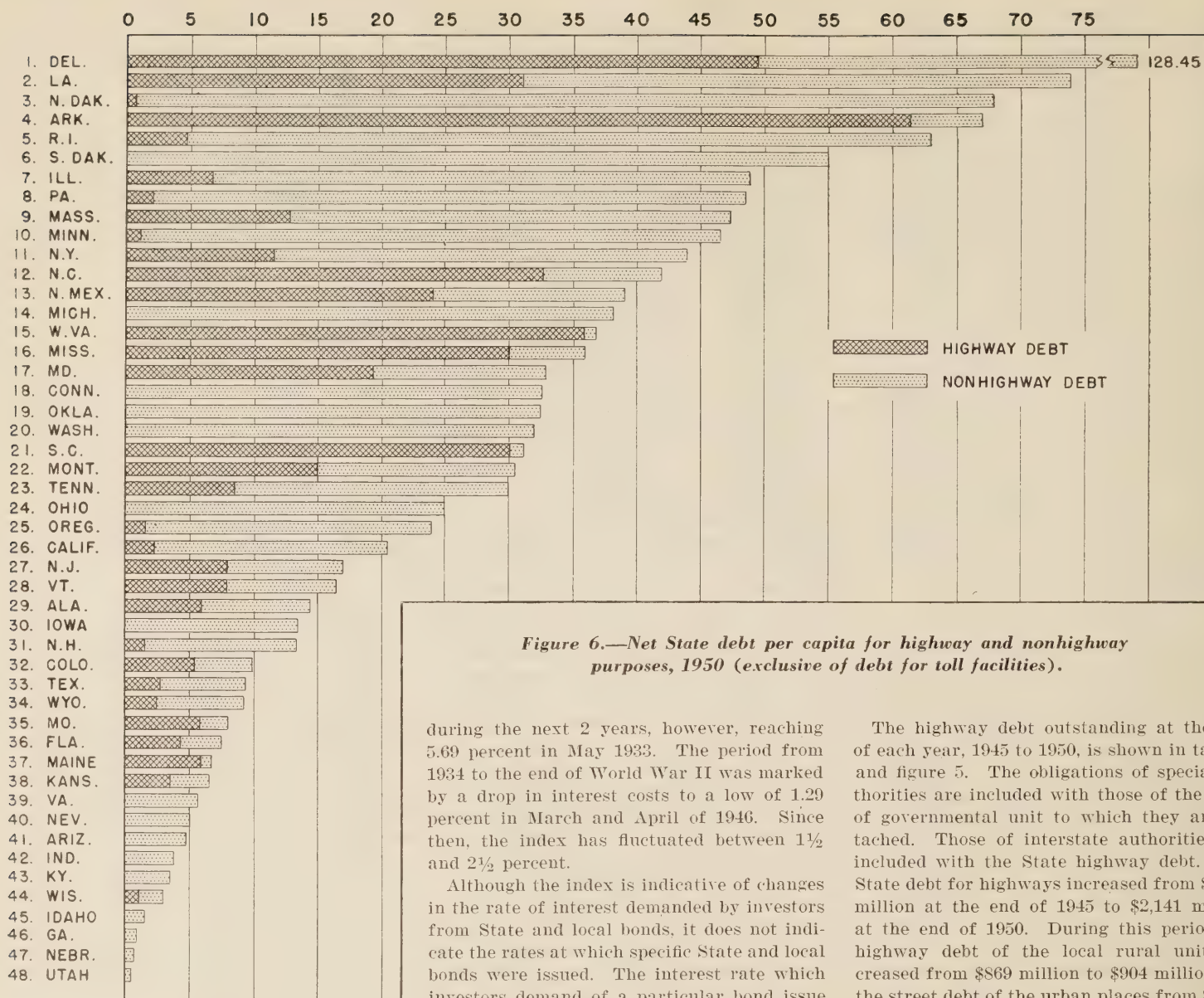


Figure 6.—Net State debt per capita for highway and nonhighway purposes, 1950 (exclusive of debt for toll facilities).

during the next 2 years, however, reaching 5.69 percent in May 1933. The period from 1934 to the end of World War II was marked by a drop in interest costs to a low of 1.29 percent in March and April of 1946. Since then, the index has fluctuated between 1½ and 2½ percent.

Although the index is indicative of changes in the rate of interest demanded by investors from State and local bonds, it does not indicate the rates at which specific State and local bonds were issued. The interest rate which investors demand of a particular bond issue may be either higher or lower than the going rate as indicated by the index. Chief among the factors which may contribute to this variation are the credit rating of the issuing government, the security pledged to the redemption of the loan, and the maturity and redemption terms of the issue. All other conditions being equal, the interest rate that a government must pay depends on market conditions at the time of the sale.

POSTWAR CREDIT FINANCING

Since 1945, State and local borrowing for the construction of highways has increased tremendously. During the 5-year period 1946-50, the States and special State authorities or commissions borrowed \$1,057 million, the counties and other local rural road agencies \$444 million, and the urban units \$685 million—a total of \$2,186 million. During this period, however, debt incurred in prior years was being retired, with the result that the total outstanding debt increased only \$827 million, from \$3,730 million at the end of 1945 to \$4,557 million at the end of 1950.

The highway debt outstanding at the end of each year, 1945 to 1950, is shown in table 6 and figure 5. The obligations of special authorities are included with those of the class of governmental unit to which they are attached. Those of interstate authorities are included with the State highway debt. The State debt for highways increased from \$1,638 million at the end of 1945 to \$2,141 million at the end of 1950. During this period the highway debt of the local rural units increased from \$869 million to \$904 million and the street debt of the urban places from \$1,223 million to \$1,512 million.

For the country as a whole, the total highway debt outstanding at the end of 1950 is not of alarming proportions. It is slightly more than the \$4,532 million spent for all highway capital outlays during the 2 years 1949 and 1950. This includes Federal expenditures of \$103 million not classified by system. The outstanding State highway debt is only 72 percent of the total expenditures (\$2,931 million) for capital outlays on State highways during those years, and the outstanding county debt for highways is 1.2 times the expenditures (\$762 million) for capital outlays on county and other local rural roads during the same 2 years. The outstanding highway debt of the urban places is slightly more than double the sum of the 1949 and 1950 expenditures (\$736 million) for capital outlays on city streets.

Per-Capita State Debt

The amount that a State or local unit can borrow for highways, aside from legal restrictions, is conditioned to a considerable degree by the amount of highway debt already in-

Since the index is indicative of municipal credit in general, it therefore reflects not only changes in interest cost resulting from changes in the volume of money available for investment, the supply of investment opportunities, and other economic conditions; it also reflects changes in conditions peculiar to municipal securities, such as Federal income-tax rates and the faith of investors in the security of municipal bonds as compared with other forms of investment.

As is apparent from figure 4, the interest return on municipal bonds has varied between rather wide limits during the past 50 years. The first 20 years of this century witnessed a gradual increase in interest costs except for a moderate drop during World War I. After climbing to about 5¼ percent in 1920 and 1921, the index rapidly dropped to a little over 4 percent in 1922 and fluctuated near this level during the next 7 years. Following an increase to almost 4½ percent in October 1929, the index dropped to 3.74 percent in June 1931, the lowest since 1907. Interest costs, as represented by the index, increased rapidly

Table 7.—Total urban borrowings for highways and streets in selected years

State	1941	1945	Postwar years					Totals, 1946-50
			1946	1947	1948	1949	1950 ¹	
	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars
Alabama	359				1,899	5,094	1,528	8,521
Arizona	85	9	9	140	1,179	2,708	830	4,866
Arkansas	24			35			200	594
California	113	2,250		4,663	3,235		8,895	16,793
Colorado	48	35	72	86	86	18	3,700	3,962
Connecticut	870		803	544	490	1,099	420	3,356
Delaware				300			492	792
Florida			25	455	848	6,135	3,480	10,943
Georgia	100	30	1,694	3,087	757	651	559	6,748
Idaho			647	783	127	466		2,023
Illinois	70	162	319	2,001	16,560	4,899	8,290	32,069
Indiana	6	12	12	25	31	301	683	1,052
Iowa	3,714	113	550	378	1,276	1,585	1,419	5,208
Kansas	1,442	331	2,640	3,008	6,684	9,266	6,273	27,871
Kentucky	167		11	179	98	17	30	335
Louisiana	980	134	372	3,593	5,235	10,965	9,467	29,632
Maine	335	38	230	61	111	148		550
Maryland	110	100		15,400	100	275		15,775
Massachusetts	1,780		4,587	5,834	4,572	7,006	8,449	30,448
Michigan	526	217	718	1,121	1,874	7,541	7,159	18,413
Minnesota	1,026	24	1,338	1,116	4,836	3,481	4,984	15,755
Mississippi	503	519	957	3,960	2,921	2,266	4,121	14,225
Missouri	74	178	660	604	900	152	5,857	8,173
Montana	96	19	6	11	195	245	231	688
Nebraska	623	297	170	1,504	3,614	3,028	2,700	11,016
Nevada	15	19	43	196	192	578	182	1,191
New Hampshire	355			540	693	666	110	2,009
New Jersey	1,081	93	1,835	1,364	1,532	4,700	2,554	11,985
New Mexico		100	25	95	635	552	650	1,957
New York	5,506	14,724	14,413	31,735	21,009	43,009	26,657	136,823
North Carolina	458	172	2,815	3,150	2,983	2,167	2,111	13,226
North Dakota	97	1	166	947	524	1,230	1,056	3,923
Ohio	3,236	3,855	5,757	5,753	8,852	12,753	16,385	49,500
Oklahoma	1,174	135	862	74	229	412	10,278	11,855
Oregon	547		85	417	211	592	749	2,054
Pennsylvania	919	78	82	2,535	2,313	12,855	15,061	32,846
Rhode Island	223	478	288	659	837	1,425	3,750	6,959
South Carolina	200				216	728	1,450	2,394
South Dakota	28	15	300	700	75	435	155	1,665
Tennessee	1,043	579	2,099	5,276	1,137	4,226	3,267	16,005
Texas	2,035	3,958	16,382	12,808	15,033	19,537	26,278	90,038
Utah	62	42	6	60	192	44		302
Vermont	50		200	75	62	101	453	891
Virginia	2,136			5,122	7,204	2,273	7,075	21,674
Washington	5	595		95	18	786	1,000	1,899
West Virginia	2,870	750	20		39	85	190	334
Wisconsin	244		1,865	1,730	300	1,243	716	5,854
Wyoming ²	200							
Total	35,585	30,062	63,063	122,219	121,914	178,102	199,894	685,192

¹ Estimated. ² Data not available subsequent to 1941.

curred and also by the amount of the total debt, highway and nonhighway. It can be observed in figure 6 that there is great variance among the States in per-capita debt and its division between highway and nonhighway components. Toll-facility debt is not considered in this part of the discussion. Although the inclusion of their debt as a part of total State debt can readily be justified, the fact that a number of the larger toll facilities draw chiefly from interstate or out-of-State traffic would tend to distort a comparison of per-capita debt which included them. Limited obligations and reimbursement debt are taken into account.

All States have some net debt, but in nine States per-capita total debt does not exceed \$5. Sixteen States have no highway debt other than toll-revenue bonds. On the other hand, six States have total per-capita debt of \$50 or over, and one, Delaware, has a per-capita debt of \$128. The State having the highest per-capita highway debt is Arkansas,

with \$61. In no other State is per-capita highway debt over \$50, although Delaware, Louisiana, North Carolina, West Virginia, Mississippi, and South Carolina have per-capita highway debt between \$25 and \$50. Some States with little or no highway debt have relatively high nonhighway debts—among them North Dakota, Rhode Island, South Dakota, Minnesota, Connecticut, Oklahoma, Washington, and Ohio. State debt as a whole, highway and nonhighway, is not particularly burdensome in most States, however. In half the States per-capita total debt is less than \$25, and in two-thirds is less than \$35. Of the total State debt in all States, including limited obligations and reimbursement debt, but not including toll-revenue bonds, highway obligations constitute 30 percent.

Similar comparisons of per-capita debt could be made for the local rural and urban governments (including the counties). However, comparisons of local debt on a State-wide basis would have little meaning, and

comparisons among the more than 34,000 local units, many of which are overlapping, which have some highway responsibility would be too voluminous for inclusion here. In attempting to appraise the burden of existing debt, or the capacity for supporting additional debt, consideration must be given not only to the resources and obligations of the unit itself but also to those of overlapping or superior units.

In the paragraphs which follow, more detailed consideration is given to recent trends in highway bond financing at all levels of government. First, attention is given to highway and street obligations issued by the cities and other urban places; and, next, to those of the counties and local rural highway agencies. Finally, the State highway obligations, already touched upon, are subjected to further scrutiny.

Urban Borrowings

Table 7 gives the amounts of highway and street bonds issued by the cities of each State in the years 1946-50, with the years 1941 and 1945 included for comparative purposes. Figure 7 shows the geographical distribution of the total sales for the 5-year period 1946-50.

It is safe to assume that the estimated borrowings of the urban units for street purposes are understated. Although urban street-finance studies are now being conducted in over 40 States, the degree of coverage varies. To complicate matters further, data concerning urban special-assessment districts are not always available and in some States these districts account for a considerable portion of the local street construction.

The urban units of all States but one are known to have issued bonds for street purposes during the period studied; no data were available for Wyoming.

A combination of factors in recent years has encouraged the urban units to enter the credit-finance field to provide funds for city street improvements. Among these factors are the following:

1. The urban units are enjoying their most favorable financial condition since the 1920's. The result is improved credit ratings and lower interest rates.

2. The deficiencies of the urban arterial systems have reached such alarming proportions that immediate action is imperative.

3. State highway-user revenues have reached new heights and the States are assuming their share of the cost of urban projects, thereby easing the burden on the urban units, and making feasible the development of urban arterial facilities.

4. The Federal-aid Highway Act of 1944 specifically authorized \$125,000,000 annually for the first three postwar years for the improvement of the urban Federal-aid system; and similar authorizations have been continued in the Federal-aid highway acts of 1948, 1950, and 1952.

Cooperative projects, involving Federal, State, county, and city participation, grow in importance yearly and have given a much-needed impetus to the construction and im-

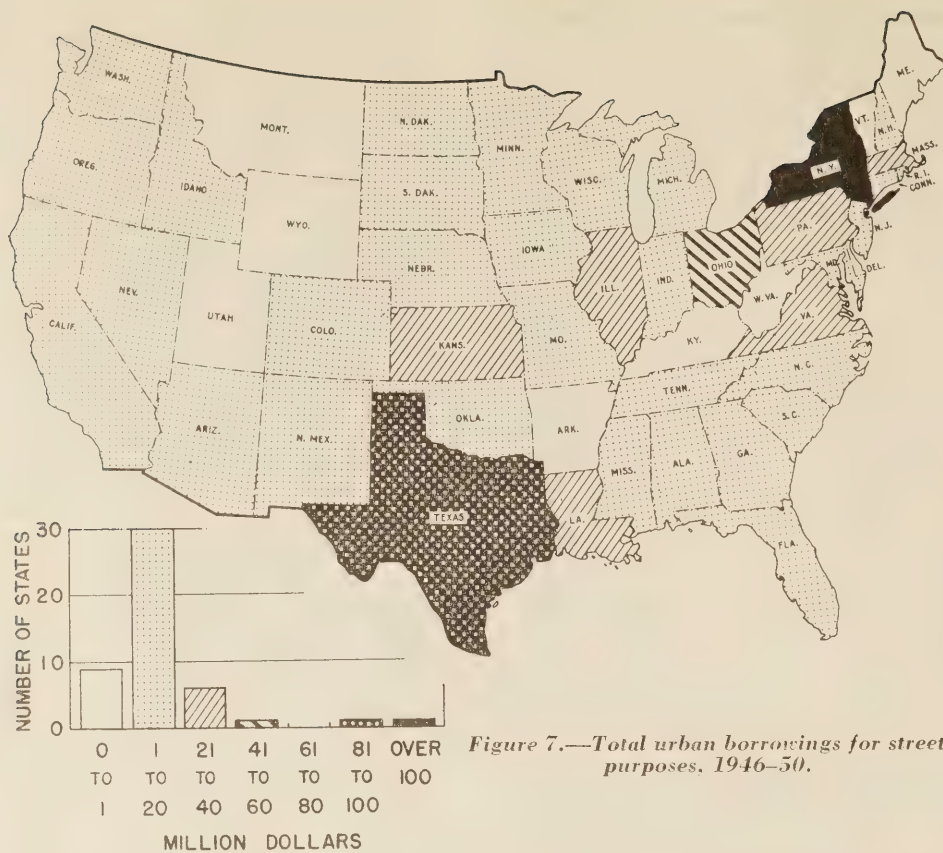


Figure 7.—Total urban borrowings for street purposes, 1946-50.

provement of urban arterial highway facilities. Before the advent of these cooperative projects many of the cities were unable to finance the construction of vital arterials because of the tremendous costs involved. The division of the project costs between themselves and other governmental units has made it possible for the urban units to finance successfully their portion of the projects. In many of the larger urban projects which are being constructed on a cooperative basis the municipal portion of the costs is being financed with the proceeds from bond sales. The methods of financing these projects are discussed in detail later.

In nine States, during the period 1946-50, the urban units borrowed less than \$1 million; in thirty States, from \$1 to \$20 million; and in six, from \$21 to \$40 million. In Ohio, \$49.5 million was borrowed; in Texas, \$90 million; and in New York, \$136.8 million. The urban units in these three States accounted for 40 percent of the total postwar borrowings of the incorporated and other urban places. Because of its large urban population, it is not surprising that New York State leads the list; but the Triborough Bridge and Tunnel Authority accounted for \$81 million of its total.

Credit financing is being widely used by Texas cities, both large and small. About one-fifth of the \$90 million borrowed by the urban places in Texas from 1946 through 1950 was for urban expressway construction in cooperation with the State highway department. During the 5-year period, the cities borrowed \$18 million for this purpose—\$16 million for right-of-way and \$2 million for construction. Borrowing for expressways accounted for a

significant part of the urban borrowings in other States, among them Georgia and Illinois.

Borrowing by Counties and Other Local Rural Units

Although borrowing by the counties, towns, and townships for highway purposes has been substantial in recent years, it has been relatively small when compared to the scale of credit financing which these same units practiced during the period 1919-29. During this earlier period, however, the local units not only financed the construction of local rural roads but also the early construction of a large portion of the present State highway systems.

It should be remembered that in earlier years the property tax was the main source of revenue for the local rural units, and that it was shortly after 1920 that farm prosperity started its long decline, culminating in a very serious depression by 1930. The counties and towns of today do not rely very heavily on the property tax. Although it is still a substantial source of revenue for local roads, it is no longer the chief source, being exceeded by State aids from road-user taxes in most States.

However, the \$444 million borrowed by the local rural units from 1946 through 1950 is no trifling sum, and is indicative of the efforts being made by those units to modernize their road systems. Table 8 shows the borrowings for road purposes by the local rural units in each State for the years 1946-50. The years 1941 and 1945 are included for comparison.

Figure 8 indicates the geographical distribution of borrowings by the counties and

other local rural units for roads during the 5-year period. There is no particular pattern evidenced nor are any pronounced regional variations apparent. Borrowings totaling \$238 million were reported in 11 out of 16 Southern States; issues totaling \$187 million were reported in 18 out of 21 Northern States; but only \$13 million was reported borrowed in 7 out of 11 Western States.

Of the 14 States in which the local rural units borrowed less than \$1 million during the period, 8 borrowed less than \$500,000 and 4 of these less than \$100,000.

Ten States incurred no local rural road debt whatsoever. Arkansas local rural units are constitutionally prohibited from incurring debt for highway purposes. In two States, North Carolina and West Virginia, the local rural units exercise no highway function except for the servicing of road debt incurred many years ago. Virginia has only three counties participating in highway activities. The Delaware counties issue bonds only for roads in suburban areas as provided by the 1945 Suburban Road Act.

Eight States accounted for 80 percent of the total local rural borrowings for the 5-year period, with the Texas counties alone issuing approximately 31 percent. That State, in recent years, has experienced tremendous gains in population and industry and, in an effort to keep pace with this expanding economy, the counties have resorted to credit financing for highway construction on a large scale. Of the remaining seven States in which the bulk of the credit financing of highways by local rural units has taken place, borrowing in Illinois and Georgia has stemmed largely from participation of the counties in large expressway projects. In Alabama, Mississippi, New Jersey, New York, and Pennsylvania the local rural units have traditionally borrowed to finance capital outlays.

Possibly another reason, although not so tangible, for the recent increase in credit financing was the material improvement in the credit ratings of the local rural units that has taken place in the last few years. At the end of 1930 the outstanding gross highway debt of these units was estimated at \$1,830 million. This had been reduced to \$1,212 million by the end of 1941, and to \$869 million by the end of 1945. This reduction, coupled with the increased and more stable sources of income, have made the bond proposals of the local units very attractive and the units, for the most part, have obtained favorable interest rates. All of these factors have tended to put a "new look" on the credit financing picture insofar as the counties and other local rural units have been concerned.

Types of Obligations Issued by Local Governments

Table 9 shows the types of local government highway debt issued, redeemed and outstanding for the 5-year period 1946-50. For the urban units, toll-revenue bond issues exceeded retirements by \$67 million, and general-obligation and special-assessment bonds showed a

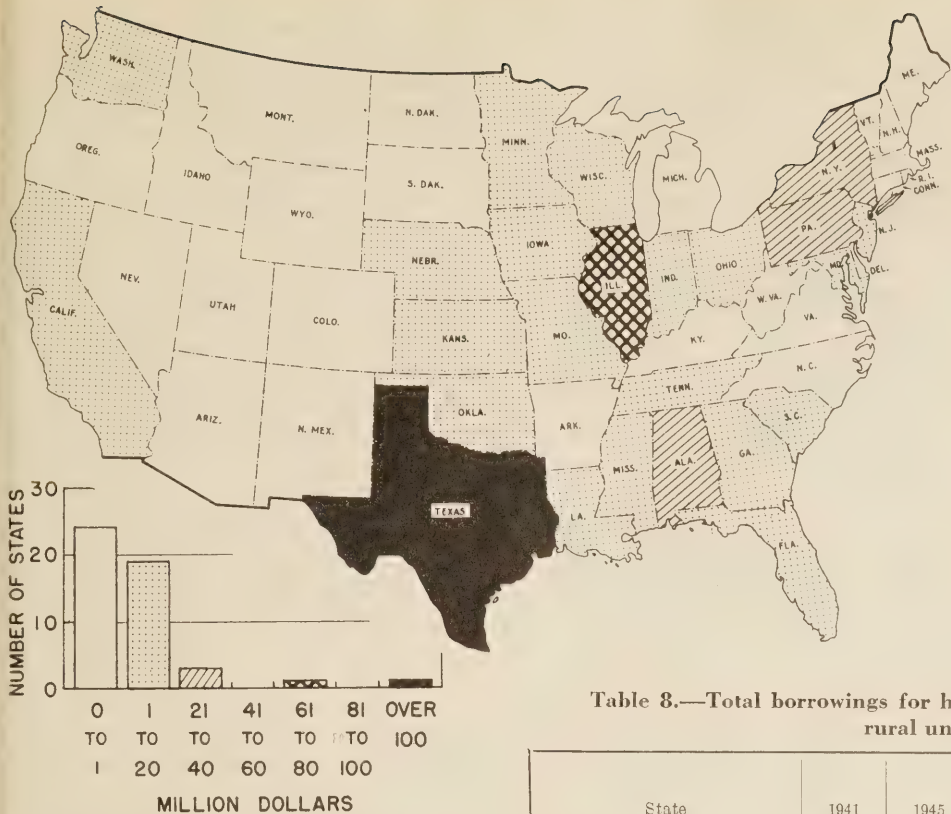


Figure 8.—Total county and local rural borrowings for highway purposes, 1946-50.

net increase of \$213 million. The majority of the urban toll-revenue bonds were issued by the Triborough Bridge and Tunnel Authority for the completion of the Brooklyn-Battery Tunnel, by the city of New York in connection with the municipal ferries, and by the city of East St. Louis, Ill., for the Mississippi River bridge: These three units account for over 80 percent of the total toll-revenue bonds outstanding at the end of 1950 with the Triborough Authority accounting for about 72 percent.

General-obligation bonds backed by the full faith and credit of the issuing unit predominate in the urban bond issues. It is believed that special-assessment bonds, once very popular and widely used before the depression, are again assuming some importance in the debt structure of the urban units. However, information on this type of debt is difficult to obtain and the available data are far from complete.

Bonds issued by the counties and local rural units are customarily general obligations backed by the full faith and credit of the issuing authority. Special-assessment bonds and toll-revenue bonds are exceptions. Although the road districts and townships in some States have issued special-assessment bonds in the past, this type of bond has never been as widely adopted by the rural units as by the urban places and has been used but little in recent years.

As shown in table 9, toll-revenue bonds secured only by a pledge of the earnings of the toll facility accounted for \$33 million, or about

7½ percent, of the \$444 million borrowed by the counties and local rural units from 1946 through 1950. This includes \$5 million advanced by the State of California to the Golden Gate Bridge and Highway District for the construction of a new Sausalito approach to the Golden Gate Bridge. The advance is to be repaid when the bonds issued to build the bridge have been retired. Also included is a \$7-million Warren County, Miss., issue for the purchase of a privately owned highway and railroad bridge across the Mississippi River at Vicksburg.

Table 9 does not indicate a pronounced shift to toll-revenue financing on the part of the local rural and urban units, such as has marked recent State borrowing policy. This may be accounted for, in part, by the lesser opportunities for toll-facility financing available to the local units. Few roads for which the counties and local rural units are responsible carry sufficient traffic to permit toll financing, and the collection of tolls on city streets is not practical.

Table 8.—Total borrowings for highway purposes by counties and other local rural units in selected years

State	1941	1945	Postwar years					Totals, 1946-50
			1946	1947	1948	1949	1950 ¹	
Alabama	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars
Arizona	2,330	307	5,278	5,067	7,238	3,772	735	22,090
Arkansas	—	—	—	141	222	71	75	509
California	68	—	5,000	—	—	—	—	5,000
Colorado	—	—	—	—	—	22	—	22
Connecticut	42	—	—	—	46	27	25	233
Delaware	—	—	—	135	—	—	—	233
Florida	1,070	14	1,500	680	2,450	1,680	—	6,316
Georgia	255	1,000	1,400	13,300	1,400	3,165	1,200	20,465
Idaho	—	—	—	—	—	—	—	—
Illinois	1,262	6,769	4,193	7,750	4,185	27,120	25,510	68,758
Indiana	—	60	80	60	542	1,954	867	3,503
Iowa	290	236	453	754	1,341	1,747	—	4,295
Kansas	1,552	20	510	2,152	627	151	250	3,690
Kentucky	60	41	—	40	32	16	—	88
Louisiana	1,384	60	758	199	100	436	714	2,207
Maine	—	3	27	44	60	402	150	683
Maryland	—	—	—	1,500	—	2,500	794	4,794
Massachusetts	—	8	83	89	221	250	200	843
Michigan	—	—	—	96	156	80	100	432
Minnesota	713	246	645	1,469	562	817	750	4,243
Mississippi	509	662	893	8,776	2,929	2,248	3,212	18,058
Missouri	12	40	2,761	1,810	1,034	1,100	1,000	7,705
Montana	—	—	200	—	—	—	54	254
Nebraska	—	—	—	91	—	—	1,970	2,061
Nevada	—	—	15	—	—	—	—	15
New Hampshire	80	—	149	142	142	150	100	541
New Jersey	2,465	553	2,185	4,331	3,830	5,945	3,507	19,798
New Mexico	—	—	—	—	—	—	—	—
New York	2,086	594	680	6,898	4,395	3,707	13,005	28,685
North Carolina	—	—	—	—	—	—	—	—
North Dakota	25	80	6	252	111	34	50	453
Ohio	925	—	725	2,100	62	644	291	3,822
Oklahoma	—	—	3,400	3,388	100	9	900	7,797
Oregon	—	—	—	450	—	150	—	600
Pennsylvania	4,049	892	2,665	3,619	8,937	10,690	10,390	36,301
Rhode Island	—	—	—	—	—	—	—	—
South Carolina	356	—	1,575	2,170	—	1,700	1,000	6,445
South Dakota	71	—	—	8	282	—	—	540
Tennessee	840	460	1,062	2,151	2,035	3,170	1,530	9,948
Texas	10,293	10,140	15,292	29,992	42,205	21,000	30,893	139,383
Utah	6	—	60	—	8	—	—	68
Vermont	—	—	—	—	—	—	—	—
Virginia	—	—	—	—	—	—	—	—
Washington	—	—	—	—	1,500	3,000	1,700	6,200
West Virginia	—	—	—	—	—	—	—	—
Wisconsin	678	—	390	5,119	590	400	660	7,159
Wyoming	—	—	—	—	—	—	—	—
Total	31,401	22,185	50,336	105,600	85,573	98,927	103,562	443,998

¹ Estimated.

Table 9.—Types of local government highway debt issued, redeemed, and outstanding, 1946-50¹

Year	Issued		Redeemed		Outstanding at end of year	
	General obligation and special assessment bonds	Toll-revenue bonds	General obligation and special assessment bonds	Toll-revenue bonds	General obligation and special assessment bonds	Toll-revenue bonds
LOCAL URRAN GOVERNMENTS						
	<i>1,000 dollars</i>	<i>1,000 dollars</i>	<i>1,000 dollars</i>	<i>1,000 dollars</i>	<i>1,000 dollars</i>	<i>1,000 dollars</i>
1945					985,032	237,837
1946	49,537	13,526	74,439	4,469	960,041	246,894
1947	102,399	19,820	68,051	6,682	994,306	260,032
1948	95,368	26,546	70,540	6,917	1,018,238	279,661
1949	135,667	42,435	71,995	12,153	1,092,514	309,943
1950	188,477	11,417	73,747	16,253	1,207,350	305,107
Total	571,448	113,744	358,772	46,474		
COUNTY AND LOCAL RURAL GOVERNMENTS						
	<i>1,000 dollars</i>	<i>1,000 dollars</i>	<i>1,000 dollars</i>	<i>1,000 dollars</i>	<i>1,000 dollars</i>	<i>1,000 dollars</i>
1945					816,345	52,773
1946	41,607	7,370	76,756	844	777,570	59,299
1947	95,232	10,965	78,380	1,369	794,987	69,006
1948	84,291	1,535	75,562	2,680	798,066	67,861
1949	94,033	4,526	77,467	2,922	815,019	69,465
1950	96,072	8,270	81,886	3,114	829,205	74,621
Total	411,235	32,666	390,051	10,929		

¹ Refunding bonds not included. As adjustments to outstanding debt made possible by more complete information could not always be carried back through prior years, the computed outstanding debt will not always agree with the actual outstanding debt.

State Borrowings

Table 10 gives the borrowings for highway purposes by the various States for the 5 years 1946-50. Again, the years 1941 and 1945 have been included for comparative purposes. Figure 9 shows the geographic distribution of the total borrowings for highways during the 5-year period covered. The geographic distribution is not highly significant but it does indicate a concentration of borrowings along the eastern seaboard. This is not surprising, as construction in urban and industrial areas is an expensive process.

Twenty-five States accounted for approximately 99 percent of all the bonds issued, and five States—Maryland, Massachusetts, New Jersey, North Carolina, and Pennsylvania—issued 55 percent of the total. The Atlantic seaboard States accounted for a little over 80 percent of the total issued.

The two largest borrowers used bond receipts for almost diametrically opposite types of roads. The \$125-million North Carolina bonds were issued to improve former county roads now under State control, while Pennsylvania issued \$164.5 million to extend the Pennsylvania Turnpike, \$15 million for State road and bridge construction, and \$8.5 million to purchase privately owned toll bridges.

During the 5-year period, 20 States incurred no highway debt whatsoever. Three States borrowed less than \$1 million: Missouri and Texas assumed small amounts of reimbursement debt, and New Hampshire issued \$650,000 in toll-bridge revenue bonds. (The bonds which replaced notes issued to finance construction of the New Hampshire Turnpike were not issued until 1951.)

The array of States would be modified somewhat if 1951 issues had been included. The latest available information indicates

that more than \$460 million in State highway obligations (including the issues of State toll authorities) were sold during that year. Of this total, \$186 million were toll-road and toll-bridge bonds and \$274 million were toll-free issues of various kinds.

Types of Obligations Issued by States

In 1948, 1949, and 1950, bond issues for State highway construction averaged over \$300 million per year. The debt transactions that have taken place during the postwar period, however, have exhibited marked differences from the experience of the 1920's and 1930's, reflecting new developments in highway finance and administration.

The postwar issues may be divided into three groups, depending on the type of security offered and income pledged to service the debt. The three types are general-obligation bonds, limited-obligation bonds, and toll-revenue bonds. The reimbursement obligations described previously, although not evi-

Table 10.—Total State borrowings for highway purposes in selected years¹

State	1941	1945	Postwar years					Totals, 1946-50
			1946	1947	1948	1949	1950	
	<i>1,000 dollars</i>	<i>1,000 dollars</i>	<i>1,000 dollars</i>	<i>1,000 dollars</i>	<i>1,000 dollars</i>	<i>1,000 dollars</i>	<i>1,000 dollars</i>	<i>1,000 dollars</i>
Alabama								
Arizona								
Arkansas						7,000	7,000	14,000
California								
Colorado							6,300	6,300
Connecticut				10,000		1,000		11,000
Delaware					42,500	7,000	2,000	51,500
Florida			3,150		10,501	5,720	28,000	47,371
Georgia								
Idaho								
Illinois								
Indiana								
Iowa	218							
Kansas								
Kentucky				1,000				1,000
Louisiana	116		2,900	19,000			10,000	31,900
Maine	500		15,000	5,000		600		20,600
Maryland	5,434	1,500			37,138	26,688	25,000	88,826
Massachusetts					27,000		60,000	87,000
Michigan								
Minnesota								
Mississippi			5,000	10,000	10,000	5,000	2,217	32,217
Missouri		297		21	2			23
Montana			323		5,000	5,500		10,823
Nebraska								
Nevada								
New Hampshire					650			650
New Jersey				7,400	5,000	4,000	75,500	91,900
New Mexico	2,000		2,000	4,000	3,000			9,000
New York	15,000		10,655	8,500			22,000	41,155
North Carolina						50,000	75,000	125,000
North Dakota					2,925			2,925
Ohio								
Oklahoma							31,000	31,000
Oregon								
Pennsylvania			1,500		87,000	101,000		189,500
Rhode Island								
South Carolina	690	4,100	6,000	5,000	20,000	10,000	10,000	51,000
South Dakota								
Tennessee								
Texas	3,143			98	38	4	339	479
Utah								
Vermont						19,000	23,000	42,000
Virginia							2,800	2,800
Washington								
West Virginia	6,350	5,000	8,000	3,650	14,000	1,650	18,500	44,000
Wisconsin	714		1,367	3,000	318	400	1,468	3,553
Wyoming								
Total	34,165	10,897	54,528	80,036	268,072	254,062	400,124	1,056,822

¹ Refunding bonds not included.

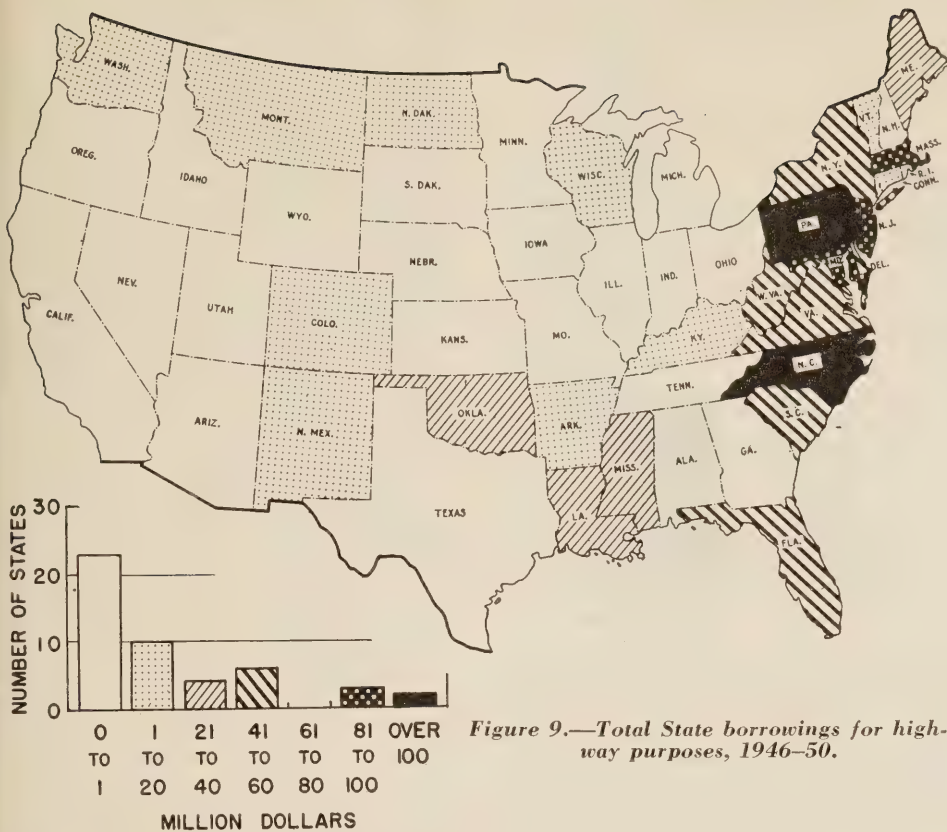


Figure 9.—Total State borrowings for highway purposes, 1946-50.

highway debt, have now ceased to be a significant factor. About \$138 million of such debt was outstanding at the end of 1945; only \$52 million was outstanding at the end of 1951.

Some recent bond issues have been secured only by the pledge of certain highway-user revenues. This type of limited obligation has shown a marked net increase since the war, from \$97 million on January 1, 1946, to \$320 million on December 31, 1951. The large issues in Maryland and Mississippi have been secured only by the highway funds. In Florida the Improvement Commission bonds for State roads are limited State obligations secured by a portion of the gasoline tax. The Pennsylvania Highway and Bridge Authority bonds are also limited obligations backed only by the motor license fund revenues. The most recent instance of limited-obligation financing on a large scale is found in Michigan's Act 22, enacted in 1950. The State highway commissioner, counties, cities, and villages are authorized to cooperate with each other or the Federal Government in issuing limited-obligation bonds for express highways, in an amount, however, not to exceed \$200 million. Debt service is to be derived from road-user revenues and other pledged funds. Limited-obligation bonds amounting to \$277 million have actually been issued by the States since 1945, an indication of the popularity of this type of borrowing.

denced by State bonds, form a fourth type of obligation incurred by the States for highways. Figure 10 and table 11 give issues, redemptions, and amounts outstanding for each type for the period 1946-51.

In spite of a net increase of \$163 million in debt outstanding at the end of 1951, general-obligation issues showed little relative net increase in the postwar period because of the large amount (over \$1 billion) outstanding at the beginning. General-obligation bonds are secured by the full taxing power of the State but, in the case of highway bonds, are most frequently serviced from highway-user revenue funds. Many States have specifically pledged all or a portion of their road-user revenues in addition to the general taxing power. Alabama, for example, services its first highway bond issue from motor-vehicle license revenues, and its second and third issues from the motor-fuel tax. Louisiana allocates the amount required from the income obtained from 4 cents of a 9-cent gasoline tax for debt service on State highway obligations. In Arkansas, 70 percent of the first \$10,250,000 of revenues of the State highway fund is set aside for debt service. In the newer Massachusetts issues, an increase in the gasoline tax of 1.3 cents is dedicated to pay interest and principal on the bonds. In many States it is probable that the pledge of road-user revenues for debt service offers, in effect, as great a security for the bond issues as does the additional pledge of the full faith and credit of the State, since the highway revenues represent one of the larger and more constant sources of the State revenues.

Reimbursement obligations, once forming a relatively large portion of outstanding State

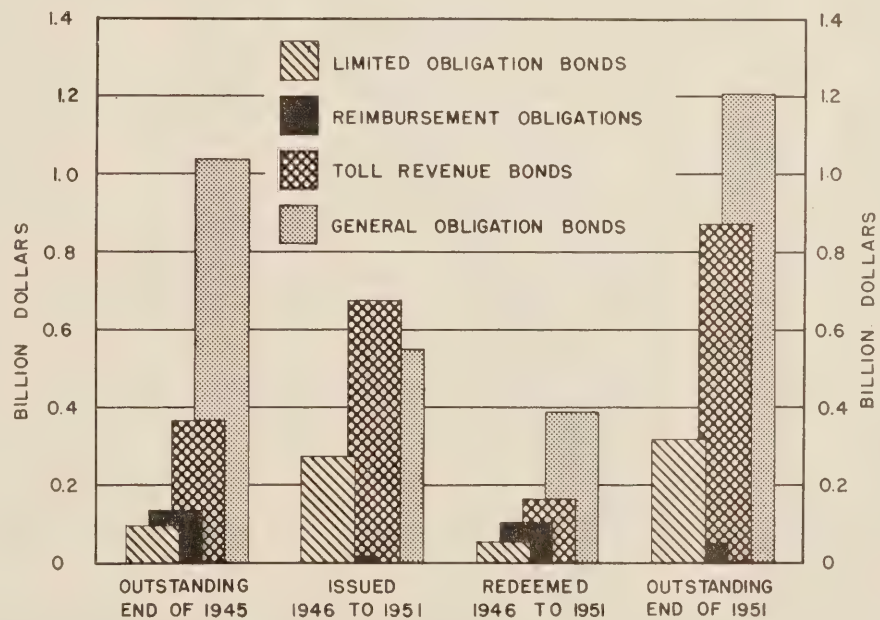


Figure 10.—Types of State highway debt.

Table 11.—Types of State highway obligations issued, redeemed, and outstanding, 1946-51¹

Type of obligation	Outstanding Dec. 31, 1945	Issued 1946-51	Redeemed 1946-51	Outstanding Dec. 31, 1951
General-obligation bonds.....	1,039,799	549,246	386,302	1,202,743
Reimbursement obligations.....	138,324	16,642	103,027	51,939
Limited-obligation bonds.....	96,570	277,012	53,886	319,696
Toll-revenue bonds.....	363,123	674,368	165,606	871,885
Total.....	1,637,816	1,517,268	708,821	2,446,263

¹ Excludes refunding.

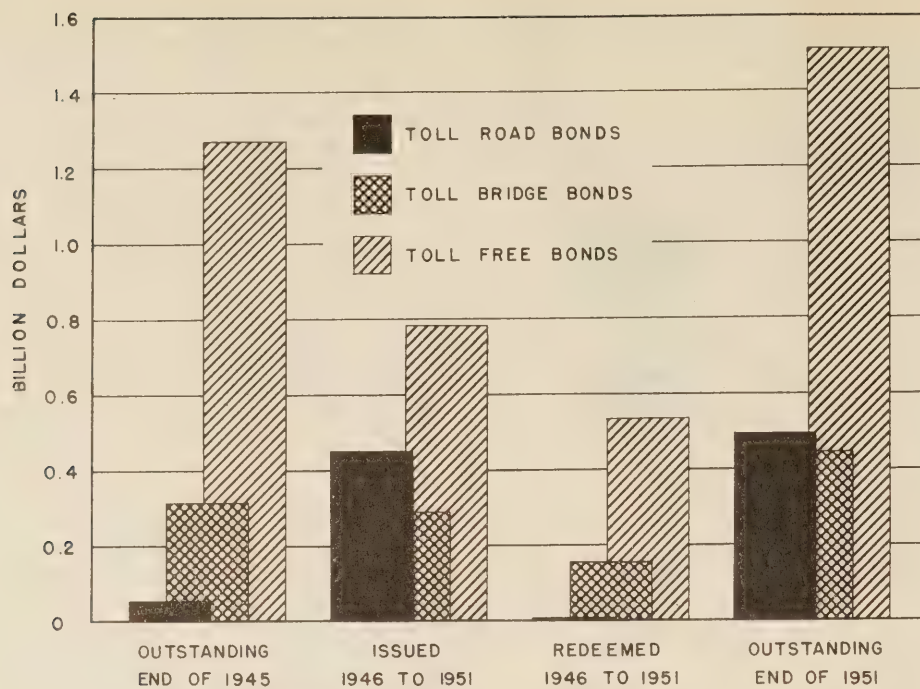


Figure 11.—Purpose of State highway debt.

State Revenue-Bond Financing

Revenue-bond financing for toll crossings and toll roads has been a dominant feature of the postwar bond picture. Toll-revenue issues since 1946, refunding excluded, have totaled over \$670 million, and the total outstanding has been more than doubled—from \$363 million to \$871 million during the 6-year period. None of this financing involves the pledge of any other revenues or the taxing power on the part of the State; it is supported solely by the earning power of the toll facilities. Immense projects such as the Delaware Memorial Bridge, the Chesapeake Bay Bridge, the Pennsylvania Turnpike extensions, the New Jersey Turnpike, and the Mystic River Bridge

which have been completed or placed under construction have been financed in this manner. Since this type of debt has reached significant proportions, a brief discussion of the history of revenue financing and public authorities is in order.

The earliest revenue-bond financing by governmental units occurred about 1890 in the State of Washington when, under a constitutional provision, municipalities were permitted to incur debt for the purpose of supplying water, lighting, and sewers. By 1910 revenue bonds were generally used throughout the United States in financing the construction of municipally owned utilities. Water districts in Maine issued revenue bonds during the 1890's, but no other public author-

Table 12.—Purposes of State highway obligations issued, redeemed, and outstanding 1946-51¹

Purpose of issue	Outstanding Dec. 31, 1945	Issued 1946-51	Redeemed 1946-51	Outstanding Dec. 31, 1951
Toll-free bonds	1,268,557	781,130	538,945	1,510,742
Toll-bridge bonds	314,778	287,638	157,705	444,711
Toll-road bonds	54,481	448,500	12,171	490,810
Total	1,637,816	1,517,268	708,821	2,446,263

¹ Excludes refunding.

ities participated in this type of financing on a large scale until the Port of New York Authority toll-revenue bond issues of 1926. About the same time the Kentucky and Ohio State Bridge Commissions resorted to similar borrowing. In the 1930's revenue-bond financing was further stimulated among the States and local units by the Federal Government's Reconstruction Finance Corporation and Public Works Administration through their policies of bond purchasing and direct grants for self-liquidating projects.

In more recent years toll-revenue financing has been largely undertaken by independent State authorities created for specific purposes. Usually the revenue derived from the facility is the sole pledge for the redemption of the bonds. Notable among such authorities concerned with highway facilities are the California Toll Bridge Authority, Pennsylvania Turnpike Commission, New Jersey Turnpike Authority, and Triborough Bridge and Tunnel Authority.

State highway obligations, which were classified according to the security pledged for their retirement in table 11 and figure 10, are classified according to the purpose for which the debt was incurred in table 12 and figure 11. It will be noted that the total toll-road and toll-bridge bonds reported in table 12 slightly exceed the toll-revenue bonds reported in table 11. This results from the fact that a few toll-facility bonds are general obligations of the State in which they are located.

As can be observed, toll-road bonds show the greatest increase—from \$54 million outstanding at the end of 1945 to \$491 million outstanding at the end of 1951. As most of the toll-road debt is relatively new, little of it was retired during the 6-year period. Toll-free facility bonds show a net increase in the amount outstanding of about \$240 million, and toll-bridge bonds a net increase of \$130 million. It is noteworthy that the amount of toll-road debt outstanding (\$491 million) now exceeds the toll-crossing debt outstanding (\$445 million) for the first time.

It should be pointed out that against the \$2.4 billion in gross debt outstanding there is approximately \$300 million in debt-service reserves of which about \$120 million is to be applied against toll-facility obligations and the remaining \$180 million against the toll-free debt outstanding. The debt-service reserves of the Pennsylvania Turnpike Commission and the Port of New York Authority constitute the greater portion of the toll-facility reserves.

Recent Examples of Credit Financing in the Highway Field

The remainder of this report is devoted to case studies of bond-issue financing in individual States. Because of the variety in the kinds of bonds issued, the nature of the security, and the circumstances surrounding the issues, it has been found desirable to segregate and discuss in turn examples of credit financing under the following main headings: Toll bridges and other toll crossings; toll roads; special State authorities; cooperative projects; and regular credit financing of State highways.

TOLL CROSSINGS

The use of toll-revenue bonds to finance the construction of expensive bridges is a time-honored practice. Many bridges that are now free were originally constructed, or purchased from private owners, with the proceeds of revenue bonds that have since been retired from toll collections. The States of Kentucky and Ohio, among others, have provided many bridges in this manner. The Federal Government has recognized the special character of toll bridges by legislative acts which authorize the use of Federal-aid funds in freeing toll bridges on the Federal-aid system, by providing not to exceed 50 percent of the cost; and also the use of Federal funds in the construction of toll bridges, provided that they shall become free when the cost to the State or local government has been retired (23).

Since the toll-revenue method of financing is usually reserved for the more difficult and expensive crossings, it is not surprising that some of the more imposing highway facilities of this type are toll crossings. Among those constructed in the past are the San Francisco-Oakland Bay and Golden Gate Bridges in California, and the George Washington Bridge and the Holland and Lincoln Tunnels connecting New York and New Jersey. Four bridges—the Delaware Memorial, the Tacoma Narrows, the Chesapeake Bay, and Lower Tampa Bay Bridges—are discussed here as illustrating postwar developments in the field of toll crossings.

Delaware Memorial Bridge

The Delaware Memorial Bridge, completed in 1951, was constructed in order to eliminate the New Castle-Pennsville Ferry, a bottleneck to interregional traffic along the Atlantic seaboard. It was undertaken by the State of Delaware which created a special Delaware Crossing Division in its Highway department to handle the construction, financing, and operation. A \$40-million revenue-bond issue was sold in June 1948 at a premium of 0.5 percent, with interest at 4 percent and maturity scheduled for 1978, with provision for call and redemption at a premium in 1953 or thereafter. In 1951, a supplemental issue of \$3.9 million was sold, with interest at

3¾ percent, to provide funds necessary to complete construction.

The bridge, carrying four lanes of traffic, has a total length, including approaches, of 10,750 feet and includes a 2,150-foot suspension span. It connects U S 40 and U S 13 in Delaware with important routes in New Jersey, including the New Jersey Turnpike, and thereby effects a direct highway connection between Washington and Baltimore and the New York metropolitan area.

Tacoma Narrows Bridge

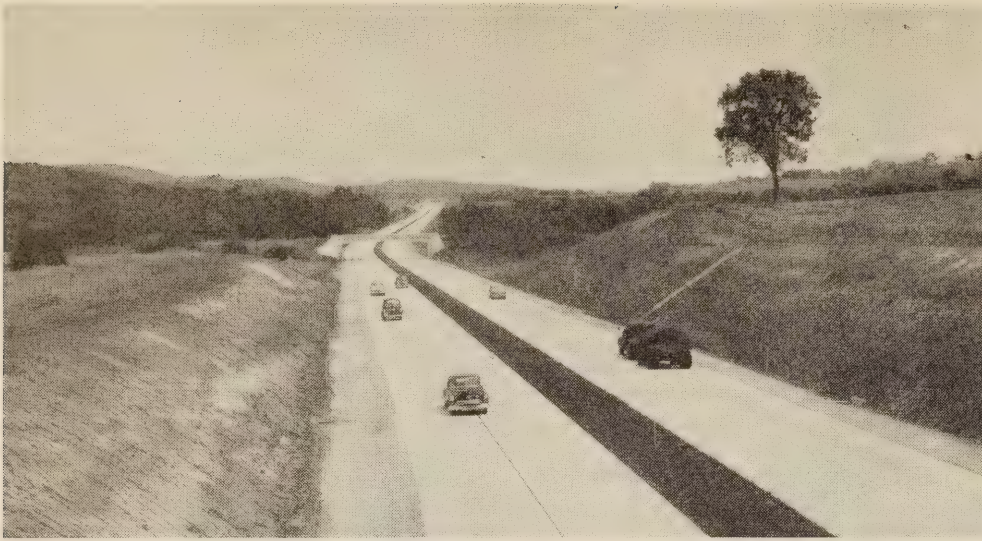
The Tacoma Narrows Bridge, originally a two-lane suspension structure, was first completed in 1940; but shortly thereafter the deck structure collapsed due to unusual wind con-

ditions in the area—the famous “Galloping Gertie” episode. Reconstruction was delayed several years as elaborate aerodynamic studies were necessary to perfect a safer bridge design. The new structure utilizes portions of the original piers and towers and carries four traffic lanes. The deck design incorporates unusual features to allow for wind pressures.

Financing of the new bridge was accomplished through the Washington Toll Bridge Authority in March 1948 with the sale of a \$14-million revenue-bond issue. The Toll Bridge Authority encountered great difficulty in selling the bonds and, after repeated efforts had failed, it entered into an agreement with Pierce County, Wash., whereby that county



The Chesapeake Bay Bridge, Maryland.



Eastern extension of the Pennsylvania Turnpike.

guaranteed interest payments up to \$1.5 million which it derived by issuing its own general-obligation bonds. The \$1.5 million was designated as the Tacoma Narrows Toll Bridge county aid fund, and can be drawn upon when toll revenues do not meet interest requirements on the toll-bridge bonds. Even with this guarantee the \$14-million revenue issue sold at 95 percent of par with nominal interest at 3¾ percent. The bridge was opened to traffic October 15, 1950. The revenues to date are considerably in excess of the preliminary estimates and, if continued at the present level, will assure the financial success of the bridge.

Chesapeake Bay Bridge

A toll crossing of Chesapeake Bay in Maryland is one of the primary postwar highway projects in that State. Financial arrangements were made in 1948 with the issue of \$37.5 million toll-revenue bonds at par. Interest was 3.2 percent on \$19 million of term bonds maturing in 1972, and 2½ to 3 percent on \$18.5 million of serial bonds. Higher costs encountered during the following year made it necessary to sell an additional \$6,425,000 of term bonds bearing interest at 3.2 percent and maturing in 1972. Completion is scheduled for July 1952.

The enabling statute required that outstanding debt of the Chesapeake Bay Ferry System be redeemed before revenue bonds could be issued. Revenues derived from the operation of existing toll bridges on the Potomac and Susquehanna Rivers are to be combined with those of the Chesapeake Bay Bridge for debt service. Of the proceeds of the \$37.5 million issue, \$362,000 were used to refund the outstanding toll-bridge revenue bonds.

In view of the established earning power of the Susquehanna and Potomac River Bridges, the security prospects of the Chesapeake Bay Bridge bonds are excellent. In fact, during 1949 and 1950, \$3,466,000 of excess toll revenues from those two bridges were

deposited in the Chesapeake Bay Bridge construction fund. The earnings of the Susquehanna and Potomac River Bridges, now debt free, average over \$2 million a year, which is a substantial share of the average annual debt service of \$2.8 million on the Chesapeake Bay Bridge bonds. Thus there is in Maryland the beginning of a system of toll-bridge financing, wherein a bridge is not made toll-free when its debt is paid; but instead its continued earnings are used to buttress the security of new enterprises.

Lower Tampa Bay Bridge

The crossing of Lower Tampa Bay in Florida involves a 30-year term issue of \$21.5-million revenue bonds by the Florida State Improvement Commission, sold in September 1951. The issue was sold at par and bears interest at 3¾ percent. In connection with this bridge the State Improvement Commission received authority in 1949 to acquire from the St. Petersburg Port Authority the ferry now serving the traffic at the projected bridge crossing. Surplus revenue from the ferry may be applied to the bridge construction fund. Contracts for the bridge were let shortly after the bonds were sold in September 1951. As of November 30, 1951, \$11,730,000 in construction contracts had been let. Unlike other State Improvement Commission issues, the Lower Tampa Bay Bridge bonds are not secured by a portion of the State gasoline tax, but only by the earnings of the toll bridge.

TOLL ROADS

The modern toll road is a comparatively recent development. Although numerous turnpikes were constructed during the early nineteenth century, following completion of the Philadelphia-Lancaster Turnpike in 1795, most of these ventures were not financially profitable. As the toll system was abandoned, the turnpikes reverted to public ownership. Turnpikes did not play an important part

in the era of highway improvement that followed the advent of the automobile. The modern toll-road movement may be said to have begun with the construction of the Pennsylvania Turnpike in 1938-40.

Toll roads are superficially similar to toll bridges and other toll-crossing facilities in that they are, or purport to be, self-supporting enterprises. However, an important difference is the circumstance that a toll bridge or other crossing is a monopoly or near-monopoly capable of serving all traffic desiring to cross at that point, while a toll road, because of its necessarily limited number of points of access, cannot serve purely local traffic traveling short distances. There is no important difference in the adequacy of service rendered all traffic by a toll bridge and a free bridge. A toll road, however, is a supplementary facility for a special class of traffic and, alone, cannot adequately serve all traffic.

It is not the purpose of this article to discuss the advantages and disadvantages of toll roads. However, a brief discussion of the toll roads that have been built, are under construction, or planned, is appropriate. A complete treatment of the modern toll-road situation will be found in *Toll Roads and the Problem of Highway Modernization*, by Owen and Dearing (24).

Pennsylvania Turnpike Commission

Article IX, section 4 of Pennsylvania's State constitution prohibits the State from incurring debt except to meet casual deficits or to repel invasions. Further restrictions limit the amount of debt that can be incurred to meet casual deficits to \$1 million. By means of amendments to the constitution, debt in excess of this amount can be incurred; but two consecutive sessions of the legislature must act favorably on the proposed amendment, and it is then submitted to the electorate. A further restriction on amendments is that no particular section of the constitution can be amended more often than once in 5 years.

Despite these difficulties Pennsylvania, in 1918, passed an amendment which authorized the incurrence of debt for highway purposes up to \$50 million. Five years later a similar amendment raised this authorization to \$100 million. In 1933 another amendment authorized the State to issue bonds up to \$10 million for the purchase of privately owned toll bridges which were located wholly within the State, but no bonds were issued for this purpose until 1949.

In spite of precedents for the issuance of general-obligation bonds by constitutional amendment, Pennsylvania has seen fit to create special authorities empowered to issue bonds backed only by the credit of the authority. Among the Pennsylvania authorities created for the purpose of issuing bonds are the Pennsylvania Turnpike Commission, the State Highway and Bridge Authority, and the General State Authority. The latter has not issued any bonds for highway purposes, although highways are within the scope of its

Table 13.—Bond issues of the Pennsylvania Turnpike Commission

Year issued	Term (in years)	Interest rate	Par value	Premium or discount ¹	Accrued interest	Net proceeds
		<i>Percent</i>				
1938	30	3.75	\$40,800,000	-\$3,368,911	\$235,687	\$37,666,776
1943	30	3.75	1,500,000	+19,500	23,281	1,542,781
1946 ²	30	2.50	46,000,000	+431,940	5,431	46,437,371
1948 ²	20	2.25	47,000,000	-1,034,000	223,250	46,189,250
1948	40	3.25	87,000,000	-1,914,000	536,915	85,622,915
1949	40	2.90	77,500,000	-1,550,000	742,917	76,692,917

¹ Premium shown as plus; discount as minus.

² Refunding issues.

pledge its full faith and credit to the revenue bonds, or to issue general-obligation bonds for the construction of the Turnpike, was reflected in the high interest rate the bonds carried and the substantial discounts at which the bonds were sold. Table 13 gives the bond transactions of the Commission from its inception to date.

The 1938 issue of \$40.8 million and the 1943 issue of \$1.5 million (both due in 1968) were retired in 1946 by a refunding issue of \$46 million bearing a 2.50 percent interest rate. Although the issuance of the refunding bonds was presumably dictated for reasons of economy, it also appeared to be a matter of necessity. The Turnpike was opened to commercial traffic just 14 months before the entrance of this country into World War II, and during the war years did not earn sufficient revenue to meet current expenditures, with the result that there was no accumulation of surplus for debt reduction. Since operating funds were depleted to make up the difference between current revenue and current expenditures, it became necessary for the Commission to acquire more capital. Of the extra proceeds (\$3.7 million) over the amount necessary for refunding purposes, \$1,692,000 was used to pay a call premium of 4 percent on the refunded issue, \$1,500,000 was earmarked for construction, and the remaining \$508,000, plus \$432,000 in premiums, was presumably available for debt service or other purposes.

In 1948, refunding bonds of \$47 million bearing an interest rate of 2.25 percent were

issued to retire and to pay interest on the \$45,086,000 of 2.50's then outstanding. The 2.50's were called on December 1, 1951, at 104, the call premium amounting to almost \$2 million.

During 1950 and 1951 interest charges amounted to \$7.2 million annually while the gross debt outstanding at the end of 1951 was about \$208 million. Interest requirements on the present debt will be about \$6 million in 1952 and will gradually decrease thereafter as the debt is extinguished, dropping to about \$4 million at the end of 20 years. The debt-service schedule provides for total principal and interest payments of from \$9 to \$10 million annually until the debt is completely retired in 1988.

The Maine Turnpike

The Maine Turnpike was the first postwar toll facility and consists of 47 miles of highway between Kittery and Portland. It is financed and operated by the Maine Turnpike Authority, a body established by the legislature in 1946 with authority to finance, build, and operate a toll highway from Kittery to Fort Kent on the Canadian boundary in the northern part of the State. There has been some consideration of toll projects north of Portland, but the 47 miles between Kittery and Portland comprise the Maine Turnpike at this time.

The original financing was accomplished through the issuance in 1946 of \$15 million



The Maine Turnpike.

The Pennsylvania Turnpike

The original turnpike constructed under authority of this act extends from Middlesex to Irwin. The construction of this first section of the Pennsylvania Turnpike was financed by the proceeds of a \$40.8-million bond issue and a PWA grant of \$29.25 million. This section also had the advantage of utilizing millions of dollars' worth of grading and some tunnel work done by the never-finished South Penn Railroad.

The acts of May 16, 1940, Public Law 949, and of June 21, 1947, Public Law 877, authorized the Commission to construct the eastern or Philadelphia extension of the Turnpike and the acts of June 11, 1941, Public Law 101, and of June 21, 1947, Public Law 377, granted it the authority to construct the western extension.

Construction on the first section of the Turnpike began in 1938 and it was opened to traffic October 1, 1940. Work on the eastern extension began in September 1948, and it was opened to traffic in October 1950. The western extension was begun in October 1949 and was opened in December 1951. The Commission now has the authority to construct connecting links north to the New York Thruway, south to the Maryland border, and also to construct connections with the New Jersey Turnpike.

The disinclination of the Commonwealth to

Table 14.—Maine Turnpike receipts and expenditures, 1947-50

	1947	1948	1949	1950	1951
	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars
Receipts:					
Tolls ¹	19	655	842	1,008	1,182
Rentals.....		12	25	29	30
Non operating income.....		15	5	4	5
Total.....	19	682	872	1,041	1,217
Expenditures:					
Operation and maintenance.....	5	275	278	277	288
Interest.....		514	523	530	529
Total.....	5	789	801	807	817
Receipts less expenditures.....	14	-107	71	234	400

¹ Opened to traffic Dec. 13, 1947.

in toll-revenue term bonds bearing 2½ percent interest and maturing in 30 years. The issue was sold at approximately 95.75 percent of par. When later studies showed that the total cost would be greatly in excess of the original engineering estimates, an additional \$5 million in term bonds bearing 2¾ percent interest was sold in 1947. These also sold at a discount. In 1949, an additional \$600,000-issue of revenue bonds was sold in order to finish the construction and provide some funds to operate the facility.

The Maine Turnpike earned gross revenues of \$1,217,000 during the calendar year 1951, an increase of 17 percent over 1950 and 39 percent over 1949. An indication of the adequacy of these revenues to service the outstanding \$20,307,000 revenue bonds (\$293,000 retired in 1951) is shown in table 14, which presents receipts and expenditures for the various years, and the net revenues available for sinking funds or bond redemption. It would appear that if the traffic and revenues of the Turnpike continue to increase it should

be able to liquidate its obligations. However, it appears to have been skating on rather thin ice during the first 4 years of its operation.

In 1949 and 1950, 90 percent of the traffic on the Turnpike was passenger vehicles, which earned 84.2 percent of toll revenues in 1949 and 82.1 percent in 1950. Passenger, especially tourist, traffic is vital to the revenues of the Turnpike, and any diminution of passenger revenues that might result in the future is likely to have disastrous effects on the Turnpike's solvency.

The New Hampshire Turnpike

The New Hampshire Turnpike, extending from Seabrook on the Massachusetts line to Portsmouth, where it connects directly with the Maine Turnpike, is 15 miles in length. The majority of the traffic on this facility is of out-of-State origin, and represents primarily vacation travel en route to recreational areas in northern New England and the Maritime Provinces.

The State used extreme care in financing this project, and avoided the high financing charges and interest costs during construction characteristic of other toll-road facilities. The facility was constructed by the State Department of Public Works and Highways and financed by the issuance of short-term notes which were purchased by private banking houses. In April 1951 the State issued general-obligation bonds for various purposes amounting to \$12.6 million of which \$7 million were for the purpose of refunding the toll-road notes. These bonds (due 1952-76) bear an interest rate of 1.60 percent and were sold at a slight premium, 100.107. Thus the net interest rate to the State was only 1.588 percent.

During the first full year of operation (July 1, 1950, to June 30, 1951) the gross revenue of the facility totaled \$391,000, with maintenance and operation charges amounting to \$39,000. The sum of \$175,000 was transferred to the sinking fund, although no interest charges on the bonds fell due in this period. On the assumption that the bond issue represents the total cost of the project, \$280,000 per year will be needed for principal amortization alone.

The New Jersey Turnpike

The New Jersey Turnpike, which extends 118 miles across the State from the new Delaware Memorial Bridge on the Delaware River below Wilmington, Del., to the George Washington Bridge, which connects New Jersey with New York City, was opened to traffic in January 1952.

The construction, operation, and maintenance of the Turnpike are being undertaken by the New Jersey Turnpike Authority, established by the legislature in 1948. The first and foremost problem of the Authority was to determine the most suitable means of financing the project. The Authority was particularly anxious to avoid the heavy bond discounts and interest charges during construction which are usually associated with toll-road financing. If financing were to be carried on in the usual manner, investment underwriting groups had estimated that a total of \$245 million in capital funds would be necessary to finance the cost of construction, of which approximately \$25 million would have been for interest payments.

Special legislation allowed the Turnpike Authority to utilize a unique alternative plan of financing. A negotiated agreement was effected with 50 insurance companies and other institutional investors whereby as much as required of the estimated \$220 million was supplied to the Authority on a forward-commitment basis. The Authority drew funds from this committed amount as construction progressed and, in turn, issued bonds of an equivalent amount, the bonds bearing an interest rate of 3¼ percent. This arrangement minimized interest charges during construction and guaranteed the sale of bonds at par. A special fee of 0.5 percent of the total commitment was paid to the investors by the Authority. The New Jersey Turnpike bonds



The New Hampshire Turnpike.

re callable in 10 years from the date of issuance at 103, with a steadily decreasing scale of premiums for bonds called after 10 years.

In September 1951 the Authority found it necessary to ask the bondholders to approve an additional \$35-million bond issue to complete the Turnpike. According to the Authority, construction costs had exceeded the original estimates and additional funds were required to effect completion. The necessary two-thirds of the bondholders granted their approval and the issue was sold in October 1951. The new issue bears an interest rate of 3.20 percent and the selling price was 98.15. At the time that the Authority asked approval of the additional \$35-million bond issue it also asked for power to issue extension bonds to finance construction of direct connections of the New Jersey Turnpike with the Pennsylvania Turnpike (estimated cost, \$12 million) and with the New York Thruway (estimated cost, \$30 million). The Authority is also studying the feasibility of constructing a bridge across Newark Bay to connect the Port Street, Newark, interchange to the Hudson County peninsula.

The Turnpike Authority has adopted a schedule of toll rates for the Turnpike which is somewhat different from those in effect on most toll roads. The rates charged for the full 118 miles range from \$1.75 for passenger cars to \$5.00 for the larger trucks. However, the toll rates on the northern end of the Turnpike are considerably higher than the rates charged on the southern section. Truck rates are rather low in comparison with those in effect on the Pennsylvania Turnpike. The low truck rates were considered necessary to attract truck traffic, as the New Jersey Turnpike offers trucks less advantages over competing routes than does the Pennsylvania Turnpike.

The New York Thruway

The constitution of the State of New York prohibits the State from incurring debt except to repel invasion, to suppress insurrection, to defend the State, and to suppress forest fires. Tax-anticipation notes can be issued. The constitution can, however, be amended in order to provide for incurring additional debt. Two successive legislatures must approve the amendment and it is then submitted to the electorate for final approval.

In 1942, legislation was passed which enabled the State Public Works Department to proceed with the construction of the New York Thruway extending from New York City to Buffalo. In 1945 a committee of engineers investigated the possibilities of installing a conventional toll system on the Thruway and reported that such a system would not produce sufficient funds to finance its construction, because of the impracticability of collecting tolls for the large volumes of local traffic in the vicinity of the various cities along the route, and the fact that the volume of long-distance travel alone would not produce sufficient revenue to amortize the cost of the project.



The New Jersey Turnpike: Newark-Jersey City interchange.

In a report of March 4, 1950, the Governor's Thruway Committee, appointed to consider a new plan for making the Thruway self-supporting, proposed the establishment of a State Thruway Authority with power to finance, construct, and operate the Thruway. The Committee recommended continuance in 1950-51 of the Thruway construction from State funds, supplemented by Federal funds wherever possible; early completion of studies, plans, estimates; and a constitutional amendment to place the State's credit back of the Authority's bonds to obtain a great savings in interest costs.

The Committee further recommended that the amortization of bonds issued to construct the Thruway should be financed by issuance of a special permit or license on an annual basis to all Thruway users. The Committee's report envisaged these stages of financing: Continue building the Thruway from State funds until the Authority's financial structure is perfected; thereafter, issue Authority short-term notes for construction; and, if the people will approve State backing of the Authority's obligation by constitutional amendment, issue Authority bonds to finance completion of the Thruway and to retire the Authority's earlier notes and pay back the State.

Thruway Authority Created

On March 21, 1950, the Governor signed the New York State Thruway Authority Act, creating a three-man board to be known as the New York State Thruway Authority. One member is designated as chairman and is the chief executive officer of the Authority. The members are appointed by the Governor with the advice and consent of the Senate. The Authority is a public corporation, and was granted all the powers necessary to construct the Thruway. It has the right to possess and use State property, but upon assuming such

jurisdiction it shall be indebted to the State in an amount equal to the cost of construction by the State of Thruway improvements on such property.

The Authority has the power to issue bonds not to exceed \$500 million. The term of such bonds cannot exceed 40 years in length, and the bonds cannot be sold at less than 98 percent of their face value, nor can the interest be more than 3½ percent. The Authority can issue bond-anticipation notes and has the power to renew them from time to time. All bonds issued by the Authority are to be general obligations of the Authority payable from any of its revenues. To the extent authorized by the constitution at the time bonds and notes are issued, the payment of the bonds or notes is fully and unconditionally guaranteed by the State.

The 1950 and 1951 legislatures acted favorably on a constitutional amendment authorizing the State to issue general-obligation bonds of \$500 million for the construction of the Thruway, and in November 1951 the electorate gave the amendment final approval by voting overwhelmingly for its adoption. Until such time as the bonds are sold the construction expenditures are being met by proceeds of short-term notes and regular State appropriations.

On September 28, 1950, the Authority embarked on its short-term finance program. It borrowed \$10 million in short-term loans at 1½ percent interest from 14 banks, backed by an agreement with two life-insurance companies to buy an equal amount of refunding long-term bonds 2 years hence. This agreement provided that if the Authority issued straight revenue bonds, forcing the banks to buy them to protect this loan, the two insurance companies would each purchase \$5 million of the bonds from the banks on a 2½ percent basis.

At the same time the Niagara Frontier Au-

thority, which operated two toll bridges on the Thruway route, turned their operation over to the Thruway Authority which agreed to retire the outstanding bonds of the two bridges and begin immediate construction of the Thruway in their vicinity.

On March 31, 1952, the Thruway Authority negotiated its first large loan—\$60 million in short-term notes bearing an interest rate of 1.1 percent and due in September 1953 were sold to a syndicate of 21 banks. Of the proceeds, \$10 million will be used to repay the loan previously discussed and the remaining \$50 million will be used to advance construction of the Thruway. According to latest reports the State has already advanced \$106 million to the Authority, of which \$26 million are to be repaid during the 1952-53 fiscal years.

Although the first proposal for collection of fees on the Thruway was by the sale of special permits or annual licenses, this has been abandoned in favor of a combined permit and toll financing system. This latest proposal by the Authority's consulting engineers recommends toll booths at 54 of the 94 interchange points plus five toll barriers at the ends of the main toll-paying section and six barriers on the spur sections. The proposed rates are as follows (25): Passenger cars registered in New York State, \$10 annual fee or 1 cent a mile; out-of-State passenger cars, 1 cent a mile; busses, 3.5 cents per mile; trucks less than 7,000 pounds unloaded weight, 1 cent a mile; and trucks over 7,000 pounds unloaded weight, 2 to 6 cents per mile (average 3.3 cents). There would be special toll fees on the Tarrytown-Nyack Bridge across the Hudson River.

This new proposal is the result of the State's new truck weight-distance tax. Thruway officials had planned to charge truckers a flat annual fee but felt they had to change their plans to conform to the tax the trucks would be paying on other State highways.

According to the latest information available (March 1952), 41 miles of Thruway were open to traffic and 100 miles were under construction. The Thruway Authority's objective is the completion of the entire 535-mile route by 1954.

Fernandina Port Authority

Article IX, section 6, of the constitution of Florida provides that the legislature shall have power to provide for issuing State bonds only for the purpose of repelling invasion or suppressing insurrection, or for the purpose of redeeming or refunding bonds already issued, at a lower rate of interest.

Although the State of Florida has no recognized bonded debt, the State indirectly uses borrowing as a means of financing highway improvements by resorting to lease-purchase agreements with the counties, municipalities, special districts, and the Florida State Improvement Commission. As required by Chapter 21853, Acts of 1943, the Constitutional State Board of Administration administers the bonds issued for the construction of bridges or highways leased for a term of



The New York Thruway near Saugerties.

more than 1 year or purchased under installment-purchase agreements by the State Road Department. The State Road Department rentals are paid from the 80-percent surplus gasoline-tax funds³ of the county or counties in which the road or bridge is located.

On October 21, 1948, the State Road Department entered a lease-purchase agreement with the Fernandina Port Authority, effective upon completion of a toll road to be constructed by the Authority. The Port Authority issued \$4.6 million in revenue bonds which bore a 4-percent interest rate. Proceeds from the sale of the bonds were to be used for the construction of a 16-mile toll road, connecting bridges, and ferry connection in Duval and Nassau Counties. Construction started March 16, 1949. The revenue bonds are not general obligations of the State or the counties and will be serviced from tolls and State Road Department rentals.

The lease-purchase agreement between the State and the Port Authority, under which the State agrees to maintain a portion of the toll road, does not become effective until the facilities have been completed and put in operation. The project was not certified as complete until February 1952, although it was opened to traffic in the fall of 1950. As the project has been operating at a deficit, the Authority defaulted on the \$92,000 interest payment due in November 1951 and the State Road Department agreed to make the pay-

³ The State Board of Administration receives the entire proceeds from 2 cents of the gasoline tax for the service of county road debt incurred prior to 1931 and, after providing for current debt service and sinking fund requirements, divides any surplus of these funds accruing to the credit of a county as follows: 80 percent to the State Road Department to be expended in said county and 20 percent to the county for use on the county road system. The funds so distributed to the State are commonly referred to as 80-percent surplus gasoline-tax funds.

ment. Reorganization plans were put into effect by which the State Board of Administration took over the management of the project, along with the assets and liabilities of the Authority.

Other Toll Roads

Four other active toll-road projects are the Ohio Turnpike, the Oklahoma Turnpike, the Denver-Boulder toll road in Colorado, and the West Virginia Turnpike.

The Ohio Turnpike is by far the largest undertaking of the four. It contemplates the construction of a 241-mile road from the western terminus of the Pennsylvania Turnpike, passing near Youngstown and Akron, to Toledo, and thence to the Indiana State line. It will also pass within easy access of Cleveland. The estimated cost is \$326 million. After the engineering report and the preliminary studies of the consulting engineers had been accepted by the Turnpike Commission the information was examined by the financial advisor to a group of interested investment bankers. The financial advisor approved of the project from a financial viewpoint, but advised the investment syndicate not to finance it because of a legal flaw concerning acquisition of right-of-way in the provisions of the Ohio Turnpike Act.

It appeared that the Commission could not acquire right-of-way until cash payment had actually been made for the property involved. It was feared that litigation could delay construction progress considerably. A special session of the Ohio Legislature which convened December 10 amended the Turnpike Act to overcome this objection. The amendment authorizes the Commission to take possession promptly of land condemned for right-of-way purposes. A friendly suit, filed in the Ohio Supreme Court to test constitutionality of the turnpike act and the recent amendment, resulted in a favorable decision.

On June 4, 1952, the Turnpike Commission sold \$326 million of 3¼-percent term bonds, maturing in 40 years. The issue was sold at 97.60 and re-offered by the underwriters at par.

The Oklahoma Turnpike will include 88 miles of road between Oklahoma City and Tulsa, originally estimated to cost \$31 million. Definite construction plans were completed in 1950, and \$31 million of revenue bonds were sold through an investment underwriting firm at an average interest cost of 3.4 percent. Completion date of this project is set for January 1953. Increased costs made it necessary for the Authority to sell an additional \$7 million of bonds in June 1952, at an average interest cost of 3.84 percent. These bonds will mature in 1990.

The Denver-Boulder toll road in Colorado, now completed, was financed from the proceeds of a \$6.3-million toll-revenue bond issue sold at par, with interest ranging from 2½ to 3 percent. The State is guaranteeing up to 30 percent of the debt service on the bonds. Construction and operation is being undertaken directly by the State Highway Department.

The West Virginia Turnpike Commission in April 1952 offered a \$96-million revenue-bond issue which was purchased by a large banking syndicate. The 3.75-percent bonds were re-offered to private investors at a price of 99. Unverified reports indicate that the syndicate purchased the bonds at 95 which would mean that the bonds were discounted \$4.8 million, and the net interest cost to the Commission would be about 3.95 percent. The proceeds of the issue will be used to finance the construction of that portion of the Turnpike between Charleston and Princeton, a distance of about 88 miles. The Turnpike will be the first of the modern toll roads which has only two lanes.

In other States—including Florida, Georgia, Illinois, Indiana, Kentucky, Maryland, Massa-

chusetts, North Carolina, and Virginia—enabling legislation to establish toll facilities has been enacted and active surveys have begun on definite routes in Florida, Georgia, Massachusetts, North Carolina, and Virginia.

SPECIAL STATE AUTHORITIES

Officials in many States have been hampered in their attempts to make capital improvements by constitutional restrictions on the issuance of bonds. In most States these restrictions have not seriously impeded the credit financing of highways but the amending processes are time-consuming and the results subject to varying political winds. In some States special authorities have been created and granted corporate powers to incur debt for various purposes. These authorities issue bonds, construct facilities, and enter into leases or rental agreements with various State agencies. The rental or lease payments are set at a level that will enable the authority to make debt-service payments and handle administrative costs. The bonds of these authorities are not backed by the full faith and credit of the State.

Florida, whose constitution flatly forbids the incurrence of debt, and Pennsylvania, whose constitutional restrictions are rather rigid, are the two States in which special authorities are being used with considerable success.

Pennsylvania Authority

Act No. 128 of the General Assembly, approved April 18, 1949, Public Law 604, created the State Highway and Bridge Authority of Pennsylvania. The Authority is a public corporation and governmental instrumentality, created for the purpose of constructing and operating State highway facilities. Along

with the usual rights and powers of a corporation, the Authority has been granted the following powers:

1. To acquire under agreement with the Department of Highways, with the approval of the Governor, State highways, bridges, easements, or rights-of-way necessary or desirable for carrying out its purposes, or to lease from the Department any property now owned or hereafter acquired by the Commonwealth, for a term not exceeding 99 years, at a nominal rental or at such annual rental as may be determined. The Authority can lease to the Commonwealth or to the Department of Highways any project at any time constructed by the Authority, or any property at any time acquired, or it can sell, transfer, or convey to the Commonwealth any constructed project or any property acquired by it.

2. To fix, alter, charge, and collect rates, rentals, and other charges for the use of the facilities of, or for services rendered by, the Authority, or projects thereof, for the purpose of providing the funds necessary to fulfill the purpose of the Authority, including the payment of principal and interest on its obligations.

3. To borrow money, make and issue notes or bonds not to exceed \$40 million (the 1951 legislature increased this to \$80 million).

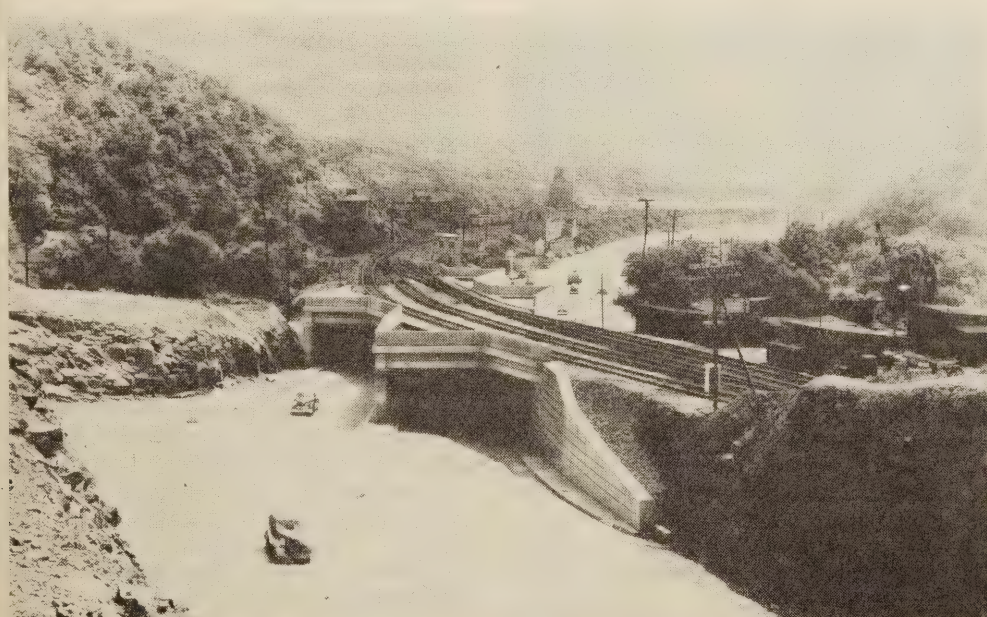
4. To borrow money or accept grants or to enter into contracts, leases, and other agreements with any Federal agency.

No project can be undertaken without the approval of the Department of Highways. The Authority cannot pledge the credit or taxing power of the Commonwealth, nor are its debts to be deemed the obligations of the Commonwealth, nor is the Commonwealth liable for interest and principal payments on its obligations. No project can be leased to the Department of Highways for a period in excess of 30 years.

The Governor of the State, State Treasurer, Auditor General, Secretary of Internal Affairs, Secretary of Highways, the Speaker of the House, President pro tem of the Senate, the minority leaders in both houses, and three citizens of Pennsylvania are members of the governing board. The Authority was formally organized May 3, 1949.

In December 1949 the Authority sold \$15 million in bonds at a price of 99.567. The bonds bore interest rates varying from 1.0 percent to 1.25 percent, and the basis, or effective interest rate, was 1.2534 percent. In April 1951 \$25 million in bonds were sold at a price of 98.9043 with an effective interest rate of 1.5909 percent.

The first highway and bridge construction program of major projects approved by the Authority Board consisted of 22 projects at an estimated cost of \$53,598,710, including \$14,375,000 in Federal aid. The program was revised by action of the Authority Board on September 25, 1950, to 27 projects at an estimated cost of approximately \$54 million—\$39,382,117 to be provided by the Authority and approximately \$15 million to be received in Federal aid. Through November 30, 1951, the Authority had made payments to contractors amounting to about \$20 million.



Pottsville bypass in Pennsylvania.



Construction under way on the Jacksonville Expressway in Florida.

All projects now on the Authority's program will require a little more than \$96.5 million in State Highway and Bridge Authority funds, and in excess of \$31 million in Federal-aid funds. Of the total program, projects involving an estimated \$43 million of Authority funds are still in the planning stage, and no Federal funds have been programed. Recent legislation has increased the Authority's debt limit to \$80 million.

The State Department of Highways has met right-of-way costs on all of the Authority's projects, and the Authority has also made use of the Department's surveys, plans, and construction inspectors. Among the projects completed, under construction, or planned by the Authority, with their costs, are the North Bridge at Harrisburg, \$7,063,000; the Schuylkill Expressway in Montgomery County, \$19,072,000; the Penn-Lincoln Parkway, \$26,914,000; and the Pottsville bypass, \$2,776,000. Included in the cost figures of the Schuylkill and Penn-Lincoln projects are Federal participation funds of \$6,940,000 and \$13,133,000, respectively.

After each project is opened to traffic the Authority charges the motor license fund a yearly rental which will amortize the cost of the project over a 10-year period. The Authority's projects are toll free.

Florida Improvement Commission

The Florida State Improvement Commission, created by chapter 420, Florida Statutes, 1941, is composed of the Governor, the Chairman of the State Road Commission, and three appointed members. The purpose of the legislation creating the Improvement Commission, as amended, is to create a State agency primarily to make possible and facilitate the acquisition, construction, maintenance, and operation of public buildings, facilities, and works for State purposes; to assist in effectuating postwar planning and construction;

to relieve unemployment; to accept and use in carrying out these purposes loans or grants of money appropriated by the Congress of the United States; and to promote the general welfare. Although the Florida State Improvement Commission is authorized to issue revenue bonds for the construction of facilities, such as airports and public buildings, of the type that can be owned and operated by an agency of the State, only the operations pertaining to highway facilities are discussed here.

Upon application by any county and approval by the State Road Department, the Florida State Improvement Commission is authorized to construct roads or bridges connecting State highways, and to finance such projects by the issuance of revenue bonds payable from revenues accruing to the Commission from the State Road Department under lease-purchase agreements. The issuance of the bonds must be approved by the State Board of Administration, which administers all bonds issued to finance the construction or purchase of bridges or highways leased for a term of more than 1 year, or purchased under installment-purchase agreements by the State Road Department from any public body, county, or other public bridge authority.

The Florida State Improvement Commission issued a little more than \$9 million worth of bonds in 1947 and 1948 for roads in 14 counties. In general, the projects constructed with these bond issues were not on principal State routes and, with the exception of a \$3.6-million Palm Beach County issue, the issues in each county were for \$600,000 or less. The State Road Department rentals are paid from the 80-percent surplus gas tax⁴ accruing to the credit of the counties in which the roads are located. The roads are toll free and are maintained by the State.

On September 25, 1950, the Improvement Commission sold a \$28-million bond issue carrying a net interest rate of 2.6187 percent to finance part of the cost of construction of the Jacksonville Expressway System, consisting of interstate expressways, arterial connections, and two new bridges (the Arlington Bridge and the Interstate Bridge) over the St. Johns River. At that time, the estimated cost of the Jacksonville Expressway System was \$41,818,000, of which the State Road Department was to provide \$13,818,000, including Federal aid. Debt-service payments will be made from rentals received from the State Road Department under the lease-purchase agreement. The State Road Department rentals will be paid from tolls collected on the two bridges, and from the 80-percent surplus gasoline tax revenue accruing to the State Road Department for use in Duval County. Maintenance and toll-collection costs will be paid by the State Road Department from other funds. However, the State Road Department is entitled to reimbursement from the Arlington and Interstate Bridge tolls for the cost of operation, extraordinary repairs, and replace-

⁴ For an explanation of the 80-percent surplus gas tax see footnote 3, p. 80.

ments of capital assets of these two bridges, but only after all bonds of series T (term bonds maturing in 1980) have been paid, and only after all required payments for debt service and reserves for the serial bonds have been fully made. The State Road Department is not entitled to reimbursement for such costs incurred on other parts of the system.

With the consent of the City of Jacksonville and Duval County, the system has been designated by the State Road Department as a controlled-access highway.

Definite plans have been made by the State Road Department, the Florida State Improvement Commission, and Broward County for the construction of tunnels and bridges in Broward County at a total cost of approximately \$15 million of which \$13 million will be borrowed and \$2 million will be contributed by the State Road Department. The bonds would carry a pledge of tolls from the bridges and tunnels and the 80-percent surplus gas oiline tax.

By the end of 1950 the Commission had issued over \$37 million in bonds of which \$36.8 million were outstanding. Inclusion of the Tampa Bay Bridge toll-revenue bonds previously discussed pushes this amount close to \$60 million.

COOPERATIVE PROJECTS

In recent years there has been an increasing number of projects in which two or more governmental units have cooperated. The inclusion of specified amounts of secondary and urban funds in the Federal-aid highway acts has probably influenced this cooperativeness in that it was necessary that the State confer with the local governmental units in programing these funds. These cooperative projects vary in magnitude, and the following discussion is concerned with the financing of a few of the larger and more prominent ones.

Atlanta Expressway System

As envisioned by the plans and recommendations of consultants employed by the Georgia State Highway Department, the Atlanta Expressway System would bisect the city as near the center as possible. The two legs of the system, one running north-south and the other east-west, would relieve traffic flow into and through the city. The proposed plan, submitted in 1945, was estimated to cost over \$60 million. As construction costs and real-estate values have increased considerably since that time, the total cost today is estimated at nearly \$80 million.

In order to finance their shares of the program, Fulton County issued \$12.5 million, and the city of Atlanta issued approximately \$4 million, of traffic-improvement bonds. Urban Federal-aid and State funds of approximately \$12 million have been added to the bond funds, making a total of \$28.5 million available for the project. The city is now considering further credit financing proposals for the continuation of the project.

At the time the bond issues were voted it was agreed by the city and county that they

would each appoint five members to a bond commission for purposes of advising the two units of government in the expenditure of the fund. This commission, known as the Joint Bond Commission, recommends the allocation of all bond funds to projects considered most essential, and their recommendations are carried out by the engineer-secretary of the commission.

The first contract was let in the latter part of 1948 and work began in early 1949. Since that time five other contracts have been let, extending the expressway portion under contract to about 12 miles. Three miles of the expressway (north-south leg) are now open to traffic, and 3½ miles more will soon be opened.

The Atlanta Expressway System is actually a system of freeways, being completely controlled-access roads with no grade crossings to interfere with free traffic flow. The downtown section is six lanes, divided, while outlying sections are four lanes, divided.

In developing this system, the city and county acquire rights-of-way and State and Federal funds are used for construction. In the downtown section it was found that the cost of right-of-way and cost of construction are approximately the same, running in general from \$1.5 million to \$2.0 million per mile for each.

Cook County and Chicago

For many years the traffic problem in and around the Chicago metropolitan area has been a subject of much study. Some progress had been made towards alleviating this congestion by the construction of the Outer Drive and Wacker Drive in Chicago, but these two projects aided relatively little in relieving the total problem.

By 1944 plans for a proposed system of expressways for the Chicago area were adopted and a committee of engineers representing all interested parties recommended that the projects be built cooperatively by the Federal Government, State, county, and city. The agreed-upon system comprises approximately 190 miles.

In 1946 Cook County and the city of Chicago submitted superhighway bond issue proposals to the electorate and both issues, the city's \$42 million and the county's \$70 million, were approved. The Illinois Supreme Court declared the county issue invalid, but the 1947 Illinois General Assembly passed enabling legislation which authorized Cook County to issue the \$70 million in superhighway bonds without referendum, and further authorized the county not only to levy taxes for debt service on the bonds but also to use the county's share of the motor-fuel tax fund for debt service. To date Cook County has issued \$35 million of superhighway bonds and the city has issued \$29 million. The county's bonds bear an interest rate of 2½ percent, and those of the city 1½ percent.

This cooperative program, of which the portions within the city of Chicago total 67 miles with an estimated cost of \$446 million, is progressing at a fairly rapid rate. It is the



The Atlanta Expressway, Georgia.

unusual cooperativeness of the four participating units of government involved that is unique. Some of the projects are financed jointly by the Federal, State, county, and city

governments; others by the Federal Government, State, and county; still others are joint ventures of the State, county, and city, or of the State and county. The Cook County Highway Department prepares plans and sells them to the State. The city and county buy right-of-way for the State and let contracts in which they advance the State's portion of the costs.

Michigan Revenue Bonds

Articles III and X of the Michigan constitution prohibit the State from incurring debt except to cover casual deficits (\$250,000 limit), to repel invasion, to suppress insurrection, and to defend the State. By means of constitutional amendments debt in excess of the constitutional limitations can be incurred. However, the pledge of specific revenues by the State Highway Commissioner for the retirement of the limited-access highway revenue bonds provided for in Act No. 22, Public Acts of 1950, is not held to be an infringement of constitutional limitations.

This act, approved June 7, 1950, amended Act No. 205, Public Acts of 1941, providing for the establishment and maintenance of limited-access highways by inserting the word "construction" in the title and making specific provisions for financing the improvements made under authorization of the 1941 act.

These acts grant the State Highway Commissioner, boards of county road commissioners, and cities and villages, either acting alone or in cooperation with each other, or with any Federal, State, or local agency, the authority to undertake the construction and maintenance of controlled-access highways, and all other powers necessary for such accomplishments. Plans and specifications are reviewed by the State Highway Commissioner and cost estimates are obtained. After their approval, the State Highway Commissioner may enter into contract with the participating governmental units providing for the acquisition, construction, or improvement of the proposed controlled-access highways. The contracts must provide for the allocation of the share of the cost which is to be paid by each participating governmental unit, and the payment of the costs in annual installments which cannot exceed a period of 30 years. The contracts are to be executed by the State Highway Commissioner after approval by the State Administrative Board and by all other participating governmental units.

The State Highway Commissioner is authorized to make annual contributions to the cost of construction from all or any highway-user imposts and to make an irrevocable pledge of such funds, but such contributions from funds of the State Highway Department are not to exceed \$3.5 million annually. The counties, cities, and villages are also authorized to make an irrevocable pledge of highway-user imposts received from the State, and of any contributions of funds received from the Federal Government, or from any other source, for the projects.

The act authorizes the governmental units that are parties to such contracts to borrow



The Edsel Ford Expressway, Detroit, Mich.

money and issue negotiable revenue bonds or notes. The bonds and notes issued under this act are secured by the irrevocable pledge of the annual contributions required to fulfill the contract agreements. The bonds are not to be general obligations of the issuing governmental units, but are to be payable from the proceeds of highway-user funds received by each of the units from the State and from other pledged funds, including Federal funds. The total amount of bonds and notes cannot, at any time, exceed \$200 million. The bonds issued under this act are not construed to be a pledge of the full faith and credit of the State of Michigan. The title of the bonds will be Limited-Access Highway Revenue Bonds.

In November 1951, \$80 million in State of Michigan Limited-Access Highway Revenue Bonds, Series I, were issued. The bonds, maturing from 1955 through 1976, sold at a slight premium (\$40,000), and the interest cost to the State was 2.1246 percent. The State pledged a minimum annual payment of \$2.5 million, and Wayne County and the city of Detroit each pledged minimum annual payments of \$1.25 million for debt service. The proceeds of the issue will be used for the construction of the Edsel B. Ford and the John C. Lodge Expressways. The total cost for the completion of the two expressways is estimated at \$134 million, and it is anticipated that Federal funds will make up the major portion of the remaining \$54 million. The official state-

ment, issued to prospective bond buyers prior to the sale on November 20, 1951, in outlining the purpose and need of the issue, states:

The pay-as-you-go basis upon which the construction has proceeded thus far would, if continued, require a period of at least 15 years to complete the two expressways. All of the participating governmental units are agreed that this plan is much too slow, as a tremendous need now exists for the expressways. To expedite the construction so that they can be completed in an estimated period of not more than 5 years, the present plan of financing has been worked out.

Texas Expressways

Houston, Dallas, Fort Worth, San Antonio, and Austin, Texas, have embarked on large urban expressway projects. These projects are cooperative ventures of the cities, counties, State, and Federal Government.

The Houston Urban Expressway System, as agreed upon by the State Highway Commission and the city of Houston, will cost an estimated \$60 to \$75 million for construction, plus \$25 million for right-of-way. The cost of the Central Expressway in Dallas is estimated at \$23 million including right-of-way. The cost of the San Antonio Expressway is estimated at \$10 million. No figures are available on the estimated cost of Fort

Worth's 17.6 miles of expressways or for the Austin program. In all of these projects the cities are acquiring the rights-of-way and paying all right-of-way costs. In most of the projects, design and construction costs are shared by the State and Federal Governments. A downtown section of the Dallas Expressway will be constructed by the city with the State paying half the costs.

Although all these cities have incurred large amounts of street debt in recent years, none of the issues have specifically earmarked any of the proceeds for expressways, with one exception: Austin issued approximately \$1 million in right-of-way bonds for expressways. Reports received from the State Highway Department, however, indicate that sizable portions of the proceeds of urban highway bond sales were devoted to right-of-way and construction expenditures on urban extensions of the State highway system. The reported facts are given in table 15. It is reasonable to assume that the bulk of the expenditures on urban extensions of the State highway system were made on the expressway systems.

REGULAR CREDIT FINANCING OF STATE HIGHWAYS

The spectacular achievements of recent years in the fields of urban expressways and toll roads and bridges have tended to overshadow the more prosaic but nonetheless solid accomplishments that have been made possible by the judicious use of general- or limited-obligation bonds issued by certain States for the purpose of accelerating a carefully planned highway program. In these States the public evidently felt that the advantages of accelerating the highway program by issuing bonds more than offset the interest costs incident to credit financing. It was also evident that, although the highway-user tax structure had been revised in order to finance the long-range program, some of the highways were so deficient that their reconstruction was a matter of immediate concern to all interested parties and could not be delayed until such time as revenues from increased taxes became available.

Among the States that have recently issued general-obligation or limited-obligation bonds in the more or less traditional fashion are Arkansas, Delaware, Louisiana, Maine, Maryland, Massachusetts, Mississippi, Montana, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Oregon, South Carolina, Vermont, Washington, and West Virginia. Examples of credit-financing activities of these types in eight States will be considered.

Maine and New Hampshire

The Maine highway-needs study, published in 1949, outlined an accelerated program requiring \$27 million in bond issues. This amount was approved by referendum vote in September 1951. Bonds will be issued at an annual rate of \$4 million for 6 years and \$3 million in the seventh year. The entire

Table 15.—Application of proceeds from urban highway borrowings, exclusive of refunding issues, in Texas

Year	For urban extensions of State highways			For local city streets			Total ¹
	Right-of-way	Construction	Total	Capital outlays	Equipment and other	Total	
1945	1,491		1,491	2,447	20	2,467	3,958
1946	3,548	² 1,018	4,566	11,752	35	11,787	16,353
1947	2,956	100	3,056	9,578	207	9,785	12,841
1948	2,253	42	2,295	12,827	88	12,915	15,210
1949	5,945	1,643	7,588	11,286	942	12,228	19,816
Total	16,193	2,803	18,996	47,890	1,292	49,182	68,178

¹ The net proceeds of both long-term and short-term borrowings are reported in this table while table 7 shows only the par value of long-term borrowings.

² Includes \$695,000 for the purchase of the International Highway Toll Bridge at Laredo.

Table 16.—Recent highway bond issues in the Commonwealth of Massachusetts

Date of issue	Amount	Interest rate	Price	Matu- rities
November 1950.....	\$60,000,000	1.25	100.06539	1951-60
May 1951.....	20,000,000	1.50	100.0685	1952-61
November 1951.....	20,000,000	1.75	100.12	1952-61
November 1951.....	4,000,000	1.75	100.2	1961-66

by the 1949 act. Also, in November 1951, \$4 million of the 1950 authorization were issued. Table 16 gives the detail on the highway bonds issued to date.

Debt-service payments are made from the highway fund, but the bonds are general obligations of the State. The 1951 legislature increased the motor-fuel tax from 3 cents to 4.3 cents in order to provide the necessary debt-service funds.

The careful planning preceding the issuance of the bonds enabled the Department of Public Works and the Metropolitan District Commission to initiate the bond construction program without delay. Under the provisions of the 1949 act the Department was authorized to expend \$92 million. As of December 1, 1951, construction costs on projects under contract or completed were estimated at \$65,367,300 and right-of-way costs at \$17,169,900—a total of \$82,537,200. This does not include engineering costs or the \$2 million expended on traffic safety devices. The 1950 authorization act contained essentially the same provisions as the 1949 act. Progress under this second bond authorization to December 1, 1951, shows \$22,185,700 in projects completed or under contract and right-of-way expenditures of \$2,229,500—a total of \$24,415,200. This total also excludes engineering costs and the traffic safety devices appropriation of \$1 million. The Metropolitan District Commission, as of January 1, 1951, had expended approximately \$5 million of the 1949 bond funds. It can be assumed that the remaining funds have been at least obligated by this time. As of July 31, 1951,

construction program, including bond proceeds and Federal aid, will average \$14 million annually for 7 years and \$8.4 million for the following 12 years. Deficiencies on 1,367 miles of the Maine State highway system will be corrected, together with those on 233 miles of Federal-aid secondary roads not on the State system. The first \$4-million bond issue will probably be sold during the fiscal year 1953.

The New Hampshire Department of Public Works and Highways has outlined a 15-year program for correcting deficiencies on 3,700 miles of State primary and secondary roads at a cost of \$90 million. In 1951 the gasoline tax was increased from 4 cents to 5 cents per gallon in order to pay interest and principal on a \$14-million bond issue. It is expected that the legislature will authorize further bond issues as the program progresses. Since 1947 New Hampshire has been financing a large part of its construction program by issuing short-term notes which may be funded into long-term bonds at a later date. In 1947, 1949, and 1951 note authorizations of \$7 million were made for State highways. These short-term notes are in addition to the \$14-million bond issue authorized in 1951. Altogether, \$26 million of highway and turnpike bonds have been provided for.

ing engineers, recommended the completion of the program within 10 years and that current revenues be supplemented by the issuance of bonds.

Chapter 306, Acts of 1949, approved in May 1949, authorized a highway bond issue not to exceed \$100 million. The act specified the areas in which most of the proceeds of the bonds were to be used: \$8 million to be expended by the Metropolitan District Commission; \$37 million for projects in the Boston metropolitan area; \$53 million for projects exclusive of the Boston metropolitan area; and \$2 million for traffic safety devices on State highways and on roads constructed under section 34, Chapter 90 of the General Laws.

In July 1950 chapter 685, Acts of 1950, authorized another \$100-million highway bond issue. Again, the legislature specified the areas in which the proceeds of the issue were to be expended—the same as for the preceding authorization except that the third item was increased to \$54 million and the fourth reduced to \$1 million.

In November 1950 the State issued \$60 million of highway-improvement bonds. In both May and November 1951, \$20 million in bonds were issued, completing the issue authorized

Massachusetts Financing

The Commonwealth of Massachusetts, towards the end of World War II, was confronted with the problem, common to many States, of coping with the anticipated tremendous increases in traffic with a highway system inadequate for even wartime traffic. Officials of the Department of Public Works were fully aware of the staggering highway needs; but because of the unpredictability of future appropriations they could not plan a cohesive long-range highway program. Diversion of highway funds to non-highway purposes was another factor contributing to this lack of financial ability, as was also the relatively low motor-fuel tax of 3 cents per gallon.

In view of this situation, long-range highway-needs studies were undertaken and reported to the legislature in 1948. There were two reports, one dealing with the Boston metropolitan area and one with the State highway needs exclusive of the Boston area. The plans recommended for adoption by the two reports carried a price tag of \$662 million, almost equally divided between the Boston metropolitan area and the remainder of the State. The report *Master Highway Plan for the Boston Metropolitan Area* prepared by Charles A. Maguire and Associates, consult-



Storrow Memorial Expressway, Boston, Mass.

over \$19 million of Federal-aid funds had been allotted to this program.

Altogether, the Department of Public Works has or will have constructed approximately 125 miles of modern highways with the proceeds of the 1949 highway improvement bonds. One of the most spectacular projects is State Route 128, the circumferential route around the city of Boston, constructed at a cost of \$20 million. It was opened to traffic in August 1951, and now carries an average daily traffic of 23,500 vehicles. Another is the John F. Fitzgerald Expressway in Boston, referred to in its planning stage as the Boston Central Artery, which will cost an estimated \$30 million, exclusive of right-of-way.

If shortages of material do not delay the program too much it is believed that the Commonwealth will be able to correct some of the major deficiencies of its highway system within a very short period of time. The tremendous accomplishments of the bond-issue program are also being accompanied by a fairly large construction program financed with current revenues. The Massachusetts legislature recently authorized an additional \$200-million highway bond issue and created a toll-road authority to construct a toll road from Boston to the western border of the State (at an estimated cost of \$150 million).

Maryland Program

Maryland has used credit financing for State highways since 1908, and by 1921 had issued more than \$23 million in highway bonds. By that year the entire State highway system had been surfaced with gravel or higher-type material. The design of early Maryland roads was, however, soon outmoded by changing traffic conditions. The State continued to supplement its current revenues with bond proceeds almost without interruption until 1941.

Maryland bonds until 1933 were full-faith-and-credit obligations and were supported, for the most part, by property-tax levies. The issues in 1933 were supported only by specific highway-user taxes as enumerated in the enabling legislation.

Issues of \$4 million in 1933 and \$3 million in 1935 were limited-obligation bonds for widening and improving already surfaced State roads. The interest record of these subsequent issues has been satisfactory and in line with interest trends for other high-grade State bonds. The 1933 and 1935 issues carried coupon rates of from 2¼ to 4 percent. These issues were refunded in 1938 at 3 percent. The 1941 issues had rates of from 1½ to 2½ percent.

The State's postwar program has relied heavily on issues of these limited-obligation bonds. An authorization of \$100 million was made in 1947, from which issues of \$25 million each were made in 1949, 1950, and 1951. The issues sold above par and at net interest costs of 1.5, 1.45, and 1.73 percent, respectively.

The legislation authorizing this issue stipulated that at least 50 percent of the bond funds were to be used to pay the cost of financ-

ing, planning, and constructing projects which have an average traffic of 3,000 or more vehicles per day. Under the authority of this legislation the State Roads Commission (26) has indicated that expressway standards will be applied to routes having not less than 5,000 vehicles per day, and that controlled access in lesser degree will be applied to improvements on routes having not less than 3,000 vehicles per day. Thus at least half of the \$100-million issue is specifically dedicated for controlled-access arterial highways or expressways.

Among the many outstanding projects on which bond funds are being used are the Baltimore-Washington Expressway, the Washington-Annapolis Expressway, the improvement of U S 50 on the Eastern Shore and the improvement of U S 40 west of Baltimore.

North Carolina Bonds

North Carolina is one of four States where all, or nearly all, rural roads are under State control. Thus the State has had to spread its available road-user funds over more than 65,000 miles of State-administered roads and streets—by far the largest network of State highways in the country. The State was also one of the first to envisage and execute a State-wide highway program and borrowed \$115 million from 1921 to 1928 to construct the initial main highway system.

After assuming jurisdiction of all roads in 1931, the State found that available current revenues had to be so widely spread that any major improvement accomplishments were almost impossible. In 1949 the voters approved the issuance of a \$200-million bond issue, to be financed from the proceeds of an additional 1-cent gasoline tax, to make possible the hard surfacing of 12,000 miles, and the stabilizing of 35,000 miles of secondary or rural roads in the State. It was planned to complete the program within 4 years, beginning as soon as possible after June 1949. In addition to the pledge of gas-tax revenues, these bonds are further secured by the full taxing power of the State.

By October 1, 1951, a little more than 2 years after the bond issue had been authorized, more than 9,200 miles of hard surfacing had been placed on secondary roads, and over 11,600 miles had been stabilized. Not all of this construction has been done with bond proceeds, but a recent sample indicates that about 81 percent of new hard-surfaced mileage has been built with bond funds.

Because of the varied topography and geology of North Carolina, the cost and types of secondary road pavements and bases used vary widely. Some roads have been improved at a cost of less than \$3,000 per mile, while on others the costs have approached \$30,000 per mile.

The cost of bituminous surface treatment or 1½- to 2-inch plant-mixed bituminous concrete on an existing road ranges from less than \$3,000 to more than \$10,000 per mile, depending on the cost of conditioning the existing road as a base. The general average for

this type of work is about \$5,000 per mile.

Sand-asphalt surfacing 1½ to 2 inches thick, which is widely used in the eastern section of the State, costs from \$4,000 to \$10,200 per mile, depending on the amount of base work necessary. The general average for this type of work in the eastern part of North Carolina is about \$7,000 per mile.

The cost of traffic-bound macadam with bituminous surface treatment, and bituminous surface treatment on soil or portland-cement stabilized base, varies from less than \$8,000 per mile to nearly \$30,000 per mile, depending on the amount of grading, the nature of the subgrade, and the availability of materials. The general average for this type of work, including grading, is in the neighborhood of \$12,000 per mile.

These costs, which are based on contract awards, do not include the cost of bridges, rights-of-way, and special items and may not include some preparatory work done before the contracts were let.

As of October 1, 1951, the entire issue of \$200 million had been sold, at an average interest rate of 1.69 percent. About \$149 million of the proceeds had been allocated to definite projects and programs, and the total expenditures from the bond fund at that date were \$112,287,000.

Although the bond-issue program was exclusively for secondary roads, the availability of the bond funds has so relieved the demands for normal secondary road needs as to make possible important benefits to the 11,000-mile State primary system. Road-user revenues otherwise available for the secondary system have been released for expenditure on the primary system, thus permitting a number of important and badly needed major improvements to be completed several years ahead of normal expectancy. Although increased revenues will account for a portion of the benefits, the following comparison illustrates how the availability of the bond funds has aided construction on the primary system. During the 4-year period ending January 1, 1949, only \$1.7 million of surplus funds could be transferred to the primary highway system for construction purposes. Since that time \$18.5 million have been made available from surplus highway funds for construction on the primary system.

West Virginia

West Virginia has followed a pattern somewhat similar to that of North Carolina in both its highway administration function and bonding program for secondary roads. The West Virginia electorate approved in 1949 a constitutional amendment authorizing issuance of \$50 million of secondary-road bonds, and the State Road Commission scheduled a 4-year improvement program to utilize these funds. A distribution formula passed by the legislature allocates to each of the State's 55 counties a flat \$200,000 plus a pro-rata share of 80 percent of the remainder of the bond fund, not to exceed a top limit of \$1.1 million, based on the total county un-

improved secondary road mileage. Under this plan the Commission will allocate about \$40.6 million on the formula basis and retain slightly over \$9 million to be used at its discretion.

On October 1, 1951, slightly beyond the mid-point of the West Virginia 4-year program, approximately 2,700 miles of road improvement had been completed out of a total of 3,010 miles authorized for construction. At this rate it is expected that the entire mileage will have been completed early in 1952. Authorized expenditures as of October 1, 1951, totaled \$33,217,000, segregated as follows:

Surveys and plans,	
1,098 miles.....	\$1, 210, 000
State force construction,	
2,120 miles.....	16, 275, 000
Contract construction,	
718 miles.....	12, 284, 000
Prison labor construction,	
162 miles.....	2, 499, 000
Right-of-way expenditures---	949, 000

During 1949, 1950, and 1951 a total of \$28.5 million of secondary-road bonds were sold at a net interest cost of approximately 1.4 percent. Maximum maturity on these issues was 15 years.

Debt-service requirements on the bonds are being met with the proceeds of the 5-cent gasoline tax but the bonds are also full faith and credit obligations of the State.

Like North Carolina, West Virginia is responsible for the maintenance and improvement of all former county roads, thus giving the State a combined primary and secondary system of 32,000 miles, the fifth largest in the country. To the extent that funds for secondary roads are currently being provided from bond proceeds the corresponding highway-user tax revenues are being released for expenditure on the 4,500-mile primary system.

Washington

Until recently the State of Washington had, by tradition, always been committed to a pay-as-you-go policy insofar as financing the construction of the State highway system was concerned. Over 30 years ago the electorate turned down a proposed \$30-million highway bond proposal. Except for a portion (21.8 percent) of the Emergency Relief Bonds of 1933 which was charged to State highway construction, the State had never incurred any debt for highway purposes. In 1951, however, the State deemed it necessary and expedient to break with this traditional policy and enter the field of credit financing of highway construction. The abandonment of the current-revenue policy was one of the results stemming from the reports, *Highways in Washington's Future* and *Financing Washington's Highways, Roads, and Streets* (27, 28). These reports were used by the Joint Fact-Finding Committee on Highways, Streets, and Bridges of the State of Washington in making recommendations to the 1949 legislature. Most of the committee's recommendations were adopted by the legislature and resulted in revising the motor-vehicle fee schedule and

raising the gasoline-tax rate, thus greatly increasing the revenues from highway-user imposts.

It was soon apparent that relief of the most serious deficiencies would not be possible with normal motor-vehicle revenues, especially those on U S 99 and the Snoqualmie Pass on U S 10. Although other projects were included in the bond program the necessity for expanding capacities on these two routes motivated the 1951 legislature in its authorization of a \$66,703,625 bond-issue program. The act authorizing the bond issue specifically earmarked the projects upon which the proceeds of the issue were to be expended: \$33,500,000 for reconstruction of U S 99 between Everett and the Interstate Bridge at Vancouver; \$15,750,000 for reconstruction of U S 99 between Everett and the British Columbia line; \$6,500,000 for the bridge across the Columbia River at Pasco; \$4,250,000 for widening Snoqualmie Pass to provide additional lanes of traffic; \$5,000,000 for county roads to serve Columbia Basin lands in Grant, Franklin, and Adams Counties; and \$1,703,625 for retiring bonds on the Agate Pass Bridge.

In August 1951 the State issued the first block of the authorized bonds. The \$12-million issue of Motor Vehicle Fuel Tax Revenue Bonds, Series A, sold at a slight premium with a net interest cost to the State of 1.8995 percent. The bonds are not general obligations of the State but the debt-service payments constitute a first and prior charge against all motor-vehicle fuel-tax revenues.

The purpose of the Department of Highways is to complete the entire bond program in 4 years; this will mean that the normal dollar volume of contracts will be almost doubled in each of the 4 years. As of December 1951, contracts upon State highways (exclusive of the Columbia Basin roads) had been awarded in total amount of approximately \$5 million and the procurement of rights-of-way was actively in progress. It is apparent that Washington's highway users will soon be enjoying the benefits of this accelerated program.

Oregon

The report *Highway Transportation System in Oregon* (29) submitted in 1948 to the Legislative Interim Committee for the Study of Highway Road and Street Needs, Revenue and Taxation, recommended a \$705-million construction program for all roads and streets in the State of Oregon. The recommended program was divided into two classifications according to needs—immediate needs and 10-year needs. Of the immediate needs construction, \$150 million was on the State primary system. As annual current revenues of about \$15 million were not sufficient to relieve the intolerable deficiencies of the system, the 1951 legislature authorized a \$40-million bond issue to accelerate the program.

The authorization makes no designation of the projects or highways on which bond funds are to be used but does limit the amount to be issued in any one year to \$15 million. The

bonds are general obligations of the State. The legislature further stipulated that the bonds should be 20-year serials payable in equal installments beginning the year after the bonds were issued, and that the effective average rate of interest was not to exceed 2½ percent.

As the expenditure of the funds was left to the discretion of the Highway Commission, it was decided to utilize the bond money on interstate routes and a few others of the more heavily traveled routes; also on especially large projects where the cost involved is larger than can be absorbed in the limited current-revenue programs. Of the \$40-million authorization, \$22.8 million have been programmed and approximately \$10.5 million worth of projects have been let to contract.

In September 1951 and again in February 1952 the State sold \$15 million of the bonds at effective interest rates of 1.6152 and 1.63476 percent, respectively.

The State Highway Department estimates that within 3 years, with the \$15 million in current revenues combined with the bond funds, it will complete half of the immediate needs program.

The State is planning to utilize Federal-aid funds for the retirement of the bonds.

CONCLUSION

In this article we have inquired briefly into the principles of public credit as applied to highways. Both logic and experience lead to the conclusion that credit financing is justified as a means of accelerating the improvement of the highway plant and making the benefits of adequate highway transportation available to the public at an earlier date. The most advantageous situation for the use of bond-issue financing is one which requires a short period of abnormally high construction activity, to be followed by a period of relatively low construction expenditures, during which replacement needs accumulate slowly and revenues are available for retirement of the bonds.

A review of credit financing of highways as it has actually been going on during the past few years discloses considerable variety in the methods used in different States, and sometimes in the same State. Toll-revenue financing of major routes in certain States now holds the spotlight. Other States are proceeding to make it clear that toll-free financing of expressways and other major arterials is not a dream but a reality. General-obligation bonds retain their popularity in a number of States, because of the virtual certainty that they will be marketed at the rates most advantageous to the issuing government. Debt limitations and other barriers to general-obligation financing have increased the popularity of limited-obligation bonds, secured only, or chiefly, by the proceeds of road-user taxes. Obligations of this type have been issued in some States as State highway bonds differing little from general-obligation issues. In other States special State authorities with corporate powers have

been created for the purpose. In still others cooperative arrangements have provided for the issue of such securities by counties or cities.

A final thought is suggested by this analysis. Roads and bridges are built as a result of demand. More or less accurate measurements of demand in dollar terms provide the justification, or economic warrant, for highway improvements. The results of such evaluations, confirmed by the experience of

toll facilities, indicate that motorists and commercial users are willing to make rather high premium payments for premium service such as is provided by a controlled-access facility, whether toll or toll-free. Under these circumstances there is a natural temptation to think in terms of exploiting the money-making possibilities of traffic demand, rather than to adhere to the austere principles of public service. Wise and faithful stewardship demands that the public, as well as the

investor, be given a fair return on its money, whether that money is collected in taxes or in tolls. Recent efforts to improve the terms of financing toll facilities, either by general-obligation issues or by other means, suggests an increasing awareness of these principles of good government. With continued adherence to high standards of public service, time and experience will resolve the major differences of opinion regarding the best methods of credit financing for highways.

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United States System of Numbered Highways together with the Federal-Aid Highway System (also shows in color National forests, parks, and other reservations). 5 by 7 feet (in 2 sheets), scale 1 inch equals 37 miles. \$1.25.

United States System of Numbered Highways. 28 by 42 inches, scale 1 inch equals 78 miles. 20 cents.

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Financing of Highways by Counties and Local Rural Governments, 1931-41. 45 cents.
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Express Highways in the United States: a Bibliography.
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STATUS OF FEDERAL-AID HIGHWAY PROGRAM

AS OF AUGUST 31, 1952

(Thousand Dollars)

STATE	UNPROGRAMMED BALANCES	ACTIVE PROGRAM											
		PROGRAMMED ONLY			PLANS APPROVED, CONSTRUCTION NOT STARTED			CONSTRUCTION UNDER WAY			TOTAL		
		Total Cost	Federal Funds	Miles	Total Cost	Federal Funds	Miles	Total Cost	Federal Funds	Miles	Total Cost	Federal Funds	Miles
Alabama	\$5,917	\$31,656	\$16,139	457.2	\$8,818	\$4,440	173.0	\$22,976	\$11,810	401.4	\$63,450	\$32,389	1,031.6
Arizona	747	3,647	2,424	87.3	1,142	507	17.8	9,338	6,139	110.5	14,127	9,070	215.6
Arkansas	3,096	9,871	5,260	286.1	3,817	1,877	94.4	16,753	8,529	492.2	30,441	15,666	872.7
California	1,871	13,877	4,948	129.1	11,769	6,169	50.4	92,043	43,371	241.3	117,689	54,488	420.8
Colorado	3,517	5,260	2,922	105.6	2,112	1,169	62.4	12,563	6,399	245.1	19,935	10,490	413.1
Connecticut	4,781	3,649	1,926	13.0	1,572	785	2.2	11,617	5,891	24.0	16,838	8,602	39.2
Delaware	891	1,734	867	6.9	950	472	3.2	7,011	3,545	50.1	9,695	4,884	60.2
Florida	1,674	18,982	9,736	268.0	6,363	3,246	161.4	15,209	7,716	225.2	40,554	20,698	654.6
Georgia	2,832	17,274	8,863	410.4	8,515	4,329	115.8	36,266	17,296	581.7	62,055	30,488	1,107.9
Ideho	3,499	9,380	5,649	263.0	2,644	1,666	65.4	8,093	5,134	139.7	20,117	12,449	468.1
Illinois	8,481	43,353	23,958	376.0	17,775	9,224	139.7	82,222	41,600	734.9	143,350	74,782	1,250.6
Indiana	6,716	36,446	18,351	177.2	9,082	5,235	195.2	28,044	14,636	315.1	73,572	38,222	687.5
Iowa	2,076	12,461	6,732	301.8	4,127	2,119	205.8	22,232	11,116	1,008.1	38,820	19,967	1,515.7
Kansas	5,484	9,115	4,184	913.3	6,649	3,329	474.7	16,388	8,541	702.0	32,152	16,083	2,090.0
Kentucky	866	18,316	9,868	302.4	5,850	2,967	134.6	18,086	9,024	332.0	42,252	21,859	769.0
Louisiana	2,252	16,780	8,043	109.0	10,285	4,781	21.6	19,230	9,593	203.6	46,295	22,417	334.2
Maine	720	7,410	3,939	52.4	3,285	1,663	28.4	10,469	5,258	83.8	21,164	10,860	164.6
Maryland	4,614	9,412	4,393	69.6	1,617	820	41.6	10,766	5,756	30.8	21,795	10,969	142.0
Massachusetts	2,999	5,820	3,055	18.5	2,237	901	.4	51,575	25,265	46.5	59,632	29,221	65.4
Michigan	1,889	24,460	12,361	398.0	9,993	5,004	245.4	62,880	27,305	350.0	67,733	44,670	993.4
Minnesota	3,428	7,927	4,217	918.2	4,115	2,160	490.0	30,862	15,998	1,150.7	42,904	22,375	2,558.9
Mississippi	2,870	16,046	8,083	535.8	5,081	2,667	170.0	15,532	8,140	445.7	36,659	18,890	1,151.5
Missouri	9,073	24,855	12,654	759.6	13,979	6,989	222.6	38,588	20,210	589.1	77,422	39,853	1,571.3
Montana	6,854	9,295	5,374	288.6	5,272	3,108	57.3	17,523	10,548	333.1	32,090	19,030	679.0
Nebraska	11,007	12,100	6,356	567.8	3,960	1,949	107.4	19,627	9,735	648.9	35,687	18,040	1,324.1
Nevada	1,847	7,727	5,854	248.2	718	587	9.4	4,616	3,847	215.7	13,061	10,288	473.3
New Hampshire	1,204	4,769	2,374	26.7	1,413	889	10.4	4,590	2,295	30.3	10,772	5,558	67.4
New Jersey	1,537	9,767	4,801	40.8	8,329	4,164	6.3	30,879	15,272	33.9	48,975	24,237	81.0
New Mexico	1,356	3,911	2,503	121.3	1,563	1,003	56.8	10,953	6,968	297.1	16,427	10,474	475.2
New York	19,227	89,415	46,572	199.2	32,453	15,395	89.8	120,934	55,229	473.9	242,802	117,196	762.9
North Carolina	3,316	23,696	11,519	329.7	5,433	2,601	119.9	24,258	11,893	476.3	53,387	26,013	925.9
North Dakota	1,974	5,598	2,931	886.7	3,662	1,876	509.8	11,392	5,708	842.8	20,652	10,515	2,239.3
Ohio	8,542	26,958	12,952	108.2	17,556	8,380	55.5	81,383	41,213	199.1	125,897	62,545	362.8
Oklahoma	3,056	12,718	7,039	171.1	7,892	4,071	167.9	20,020	10,652	217.3	40,630	21,762	556.3
Oregon	772	2,529	1,356	4.5	2,600	1,563	51.5	16,417	8,946	234.9	21,546	11,865	290.9
Pennsylvania	5,917	24,562	12,274	63.7	28,030	13,987	89.8	77,086	38,289	158.2	129,678	64,550	311.7
Rhode Island	746	4,489	2,244	33.1	785	392	2.9	18,493	9,624	31.5	23,767	12,260	67.5
South Carolina	1,752	12,777	6,900	287.4	2,889	1,470	175.7	15,476	7,874	363.7	31,142	16,244	826.8
South Dakota	795	6,463	3,785	513.9	3,005	1,828	223.8	11,555	6,894	590.5	21,423	12,507	1,328.2
Tennessee	2,970	11,649	5,500	378.5	13,099	6,237	253.5	29,901	14,338	430.5	54,649	26,075	1,062.5
Texas	9,645	3,248	1,498	136.9	11,493	6,436	309.2	61,448	32,274	1,150.0	76,189	40,208	1,596.1
Utah	776	4,658	3,568	135.7	1,537	1,145	29.4	9,034	6,797	147.7	15,229	11,510	312.8
Vermont	1,025	4,102	2,235	34.5	599	307	6.7	7,547	3,782	62.3	12,248	6,324	103.5
Virginia	2,112	20,812	10,007	273.5	8,672	4,234	132.5	24,193	12,114	321.6	53,677	26,355	727.6
Washington	1,996	11,622	5,736	133.3	2,564	1,364	107.6	14,898	7,647	145.7	29,084	14,747	386.6
West Virginia	2,410	11,919	6,009	93.5	3,982	2,030	47.6	14,583	7,267	126.1	30,484	15,306	267.2
Wisconsin	4,507	12,469	7,024	220.0	10,285	4,568	207.0	35,195	17,241	510.7	57,949	28,833	937.7
Wyoming	157	2,594	1,701	61.7	1,355	908	49.0	9,569	6,301	189.7	13,518	8,910	300.4
Hawaii	1,524	4,188	1,934	16.1	922	458	2.3	12,832	5,347	29.9	17,942	7,739	48.3
District of Columbia	1,056	13,459	5,909	1.4				4,435	2,214	.5	17,894	8,123	1.9
Puerto Rico	5,079	6,330	3,000	39.2	3,123	1,523	15.7	11,315	5,334	36.2	20,768	9,857	91.1
TOTAL	183,652	711,555	367,527	12,373.6	324,968	165,021	6,010.7	1,358,695	683,915	16,801.6	2,395,218	1,216,463	35,185.9

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