Financial Dynamics: A Model for Forecasting Transportation Program Cash Flow

W. M. HILLIARD

A process and computer model for forecasting transportation program cash flow are described. The differences between financial management on an accrual or encumbrance basis and full cash flow management are briefly discussed. The need for a comprehensive yet compact and flexible process for relating all aspects of an organization's financing is addressed. The financial overview framework used by the Florida Department of Transportation, called the Program Plan Model, is described. The logic used to define categories and subcategories for program planning and cash flow forecasting is explained. The cash flow model is described, and its inputs, outputs, and variables are explained. Variables in the model, which include flow rates or payout rates, participation ratios, and receivables, are described. The process for calibration of the model and its reconciliation to a short-term forecast and actuals from previous years is explained. Model outputs, including menu-driven charts as well as printed tables containing all inputs, variables, and results, are outlined. A summary of selected graphical output is included. Reports for tracking and monitoring are described, and use of the model for district and resource planning is briefly discussed.

Most state departments of transportation do not operate on a full cash flow basis. Typically, annual authority for contractual commitments and expenditures is appropriated by state legislatures on the basis of forecasts prepared by a central state authority. Case flow management, if practiced, is performed by the central state authority for a combination of all state programs. In states that have a trust fund for transportation, cash to cover outstanding obligations may be on deposit in a central state account. In most cases, the cash is used in other programs, as is done with the National Transportation Trust Fund. These deposits can total as much as 1 to 3 years of revenues. Even though these funds may earn interest, the time between collection of transportation taxes and their application to transportation needs is delayed, resulting in an opportunity cost to society. Full cash flow management, as practiced by the Florida Department of Transportation (FDOT), attempts to minimize the amount on deposit in transportation trust funds by making contractual commitments against future revenues, thus drawing down the cash on deposit awaiting payout.

Financial management in a full cash flow environment is substantially different from the more common accrual or encumbrance environment practiced by most government agencies (*1*). The critical time frame is shifted from the present, for which data are known and reliable (e.g., revenue on hand, existing cash balance, etc.), to a time possibly years in the future, for which only projected values of these parameters are available. Financial control must shift from a static situation to a dynamic, less predictable one. The financial management task is broadened from one that involves primarily accounting to one that must use the forecasts and judgment of economists, engineers, production managers, and others. Additional risks are unquestionably involved, but the rewards, which may be 1 or more years of a transportation product without an increase in taxes, outweigh these risks.

Balancing commitments so that future cash flows equal available revenues without overcommitting (which would result in cash shortages) or undercommitting (which would result in high cash balances) requires a process that accurately relates future work programs to future cash flows. Because few government agencies practice full cash flow management, little information is available on the techniques used. Most forecasting work has focused on individual project forecasting or the cash flow projection of isolated components of an overall transportation program. A process is needed that incorporates all financial activity of an organization in a condensed, comprehensive way, yet simplifies and aggregates the abundant financial data to give top management a reliable "big picture" view of transportation finance. Such a model is described along with the process used by FDOT to develop work programs of transportation projects that will result in minimum, but adequate, cash balances in the trust fund while ensuring that transportation taxes are put to work in the form of transportation facilities at the earliest possible time.

PROGRAM PLAN CASH FLOW MODEL

The Program Plan Cash Flow Model (*2*) is a personal computer (PC)–based spreadsheet model used by FDOT to analyze proposed multiyear program plans to determine their cash impact on the state transportation fund and other funds. Introduced by FDOT in 1985, the model was abandoned during a period of extensive accounting system and management change. Cash flow problems that began in 1988 resulted in a critical audit by the state auditor general early in 1989 (*3*). Two studies, one commissioned by FDOT and another by the Florida Transportation Commission, resulted in reports (*4,5*) that recommended actions to correct accounting and systems

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problems and reinforced the need to restore a process relating proposed work programs to future cash flows and the accounting systems.

The FDOT Program Plan Model, which evolved from the original model and the recommendations of the two studies, is simple in design. It consists of planned program data, formulas for cash-flowing these data, flow rates (variables), fund participation rates (variables), summary schedules, graphics, and printed output showing key elements of financial analysis. These components are arrayed in a spreadsheet format with menus to transfer from one part of the spreadsheet to another. By introducing new or changed program plan, budget, flow rate, or participation ratio data, the user can determine the impact of any proposed scenario on cash, commitments, federal participation, federal matching, or other factors. The results can be viewed on graphs and printed in a set of tables and schedules.

PROGRAM PLAN

The FDOT program plan is a listing of major activities in categories corresponding to major program areas that are compatible with the way operating management views plans and tracks resources. The categories are grouped into four major areas, as follows:

1. *Product*: A product is anything a citizen can ride on, feel, or use for transportation purposes (e.g., concrete, steel, asphalt, earth, and rights-of-way). In the case of grants to other agencies (such as grants for public transportation), the product is the amount of the grant.
2. *Product Support*: Product support activities are those directly related to and in support of the production of a product, for example, planning, design engineering, engineering inspection, and work in support of the acquisition of rights-of-way, as well as some work that indirectly supports the production or improvement of the product, such as research and materials testing.
3. *Operations and Maintenance*: Operations and maintenance activities are those relating to operating or maintaining existing systems (i.e., product). This category includes routine maintenance, traffic operations, toll operations, and weight law enforcement.
4. *Administration*: Administration includes those activities that support the total organization and do not fall logically into the other three categories. Included are top management, personnel, legal, the comptroller's office, purchasing, and similar functions in the district and central office, as well as housing (offices) for these functions.

A summary of a typical program plan is presented in Table 1. The operations in the "Other" category are already included in the first four categories; because of state budgeting practice, these functions are repeated to highlight them. The "Total Budget" line thus contains a double counting of these functions but is the total that agrees with state budget reports. The "Total Program" lines are the real-dollar totals used in cash flow analysis.

The subcategories may vary and should group activities into areas of interest or concern to operating managers. These categories do not appear in legislative budgets or accounting reports, nor do they reflect organizational arrangements. In Florida, government budgets and accounting reports are designed for legislators and auditors and do not present data in forms that are the most useful to operating management, at least in transportation. Data presented in formats for operating management must be easy to translate into the formats required by legislators, budgeters, and auditors.

Summary Reports

It is essential that a condensed, one-sheet representation of all actual and planned program and budget activities be designed and used in this process. There is no limit to the amount of detailed data, and supplementary reports, that can be included. An overview capability allows management to take the big-picture approach and fosters identification of financial activities and problems in order of relative importance to the bottom line. Many organizations experience difficulty or failure because management cannot see the "forest for the trees" with the reports that are made available to them.

The summary reports of an organization's plans must contain all proposed and actual financial data relating to all activities. The bottom line for such reports should be the total budget or program in the same terms as those used by other agencies to measure the activity of the agency. For FDOT, the bottom line for the program plan is the total FDOT budget.

The act of producing summary reports and overviews that cover all activity of the agency in a closed system helps in finding errors and omissions, promotes uniformity in terms and definitions, encourages organizational cooperation, and, if used consistently over time, enhances familiarity and understanding of the reports and, thus, the organization and its business.

Segregation by Work Category

Once a program plan is prepared, it is then arrayed by appropriate work and fund categories. The work categories depend on the areas of interest to management, areas of program emphasis by the legislature and others, and areas of budget and management control, as well as the variation in cash flow characteristics of each program. For example, resurfacing work normally does not require extensive engineering, earthwork, or other activities associated with heavy construction (such as the building of interchanges). The time required between the commitment or contract letting of a resurfacing project and its completion (and thus the rate of contract payout) is much faster than more complex work, and the cash flow pattern is substantially different. Resurfacing, therefore, is segregated in the program plan, and separate cash flow rates or flow models would be used for that program. The individual phases of specific projects (such as engineering, right-of-way, and construction) will be cash-flowed in separate program groups similar to the way large programs of projects are actually managed (as opposed to individual project management). The combination of phases for specific projects for project management or other purposes can be obtained from the short-term systems or from a project scheduling system independent of the aggregate cash forecasting system. The work categories will vary depending on these

TABLE 1 PROGRAM AND RESOURCE PLAN SUMMARY

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04-Jan-90 FLORIDA DEPARTMENT OF TRANSPORTATION OMB
02:18 PM 1990 PROGRAM AND RESOURCE PLAN SUMMARY 4 DEC 89
TENTATIVE WORK PROGRAM FISCAL YEARS 1990/91 TO 1998/99
FISCAL YEARS 1990/91 THROUGH 1998/99 (MILLIONS OF $)

	COMM.	CURRENT						5 YR					4-YEAR	10-YEAR
PROGRAM AREAS	88/89	89/90	90/91	91/92	92/93	93/94	94/95	TOTAL	95/96	96/97	97/98	98/99	SUB-TOT	TOTAL
I. PRODUCT	738.0	1136.7	1187.2	1371.2	896.1	839.1	928.2	5221.8	943.1	1032.2	1050.1	1073.1	4098.5	10457.0
A. Express. Const	345.4	229.0	195.2	548.2	195.2	175.1	181.3	1295.0	264.0	272.0	281.0	290.0	1107.0	2631.0
B. Arterial Hwys.	115.6	157.8	208.6	196.8	192.3	175.8	193.8	967.3	126.1	124.9	138.2	138.2	527.4	1652.5
C. Right Of Way	26.4	422.0	408.5	314.5	129.5	92.8	112.0	1057.3	151.1	148.5	151.7	155.7	607.0	2086.3
D. Aviation	34.5	44.8	43.5	44.8	45.2	46.1	47.9	227.5	50.7	52.3	53.9	55.6	212.5	484.8
E. Transit	24.7	22.8	40.0	33.8	23.8	25.1	25.7	148.4	38.0	38.0	38.0	38.0	152.0	323.2
F. Rail	50.6	45.2	40.6	39.5	54.5	56.1	57.6	248.3	45.1	45.0	6.7	5.0	101.8	395.3
G. Safety	13.9	10.7	19.6	11.0	12.5	10.8	14.0	67.9	17.0	17.0	17.0	17.0	68.0	146.6
H. Resurface/Rehab	34.7	55.0	154.7	115.4	130.8	169.6	226.3	796.8	164.1	244.8	259.4	259.4	927.7	1779.5
I. Bridge	92.2	149.4	76.5	67.2	112.3	87.7	69.6	413.3	87.0	89.7	104.2	114.2	395.1	957.8
II. PRODUCT SUPPORT	316.9	271.2	386.4	323.8	270.2	287.1	298.9	1566.4	300.6	311.8	323.0	337.1	1272.5	3110.1
A. Prel. Eng.	147.1	103.0	139.3	111.8	114.0	120.4	123.2	608.7	98.6	103.0	108.6	114.0	424.2	1135.9
B. Const Eng Insp.	74.0	72.5	63.8	91.3	58.8	67.7	73.2	354.8	78.6	81.1	82.7	86.7	329.1	756.4
C. R/W Support	41.1	46.7	130.0	64.8	39.2	37.9	35.1	307.0	51.5	52.4	53.0	55.4	212.3	566.0
D. Material & Res.	28.2	24.4	25.9	27.3	28.6	30.0	32.3	144.1	35.0	36.6	38.2	39.9	149.7	318.2
E. Planning	21.4	18.8	20.5	21.4	22.0	23.1	26.7	113.7	28.1	29.5	30.8	30.9	119.3	251.8
F. Pub. Trans Oper.	5.1	5.8	6.9	7.2	7.6	8.0	8.4	38.1	8.8	9.2	9.7	10.2	37.9	81.8
III. OPERAT.& MAINT.	263.4	241.5	273.0	288.6	303.0	318.7	334.6	1517.9	353.0	370.4	388.9	408.4	1520.7	3280.1
A. Routine Maint.	170.4	159.4	176.5	189.2	198.7	208.7	219.2	992.3	231.2	242.7	254.9	267.6	996.4	2148.1
B. Traffic Eng.	10.9	10.8	10.1	9.7	10.2	10.5	10.9	51.4	12.2	12.8	13.4	14.1	52.5	114.7
C. Toll Oper.	73.6	61.9	75.7	78.5	82.3	87.1	91.5	415.1	95.9	100.6	105.6	110.9	413.0	890.0
D.Motor Carrier Comp.	8.5	9.4	10.7	11.2	11.8	12.4	13.0	59.1	13.7	14.3	15.0	15.8	58.8	127.3
IV. ADMINISTRATION	51.4	58.7	65.8	69.3	72.3	75.4	84.4	367.2	89.5	93.6	95.2	99.5	377.8	803.7
A. Admin.	44.0	53.9	61.2	64.3	67.3	70.4	79.4	342.6	84.5	88.6	90.2	94.5	357.8	754.3
B. Fixed Capital	7.4	4.8	4.6	5.0	5.0	5.0	5.0	24.6	5.0	5.0	5.0	5.0	20.0	49.4
TOTAL PROGRAM	1369.7	1708.1	1912.4	2052.9	1541.6	1520.3	1646.1	8673.3	1686.2	1808.0	1857.2	1918.1	7269.5	17650.9
V. OTHER	94.1	107.1	108.0	127.5	131.2	135.0	139.1	640.8	143.9	148.4	153.0	157.9	603.2	1351.1
A. Dep.Data Ctr.	13.1	12.2	14.2	14.9	15.7	16.5	17.3	78.6	18.3	19.2	20.1	21.1	78.7	169.5
B. CME	52.2	45.9	50.8	57.6	60.5	63.5	66.8	299.2	70.6	74.2	77.9	81.8	304.5	649.6
C. Non-Oper. Trnfs.	28.8	55.0	55.0	55.0	55.0	55.0	55.0	275.0	55.0	55.0	55.0	55.0	220.0	550.0
D. Offset-Pay Pack	0.0	-6.0	-12.0	0.0	0.0	0.0	0.0	-12.0	0.0	0.0	0.0	0.0	0.0	-18.0
TOTAL BUDGET	1463.8	1815.2	2020.4	2180.4	1672.8	1655.3	1785.2	9314.1	1830.1	1956.4	2010.2	2076.0	7872.7	19002.0

factors. Sometimes trial-and-error methods are required to find the appropriate categories and flow rates that will result in an accurate cash flow projection. The program categories and subcategories used in the FDOT model are presented in Table 2.

Segregation by Fund Category

The defined categories must then be segregated by fund. In a leveraged financial system that has more than one paying fund, it is not enough to know the total payout associated with a particular program. The extent of participation by each contributing fund source must also be revealed. The fund categories currently used are presented in Table 2.

Once a summary report covering all activity of the organization is available, a cash flow of each of the items included will yield a cash flow report. It is presumed, of course, that no business is conducted and no money is paid on activities not included in the program plan.

CASH FLOW MODEL

Operational use of the model to prepare a financially feasible program plan involves the following steps:

TABLE 2 PROGRAM, FUND, AND CASH FLOW CATEGORIES

PROGRAM CATEGORIES AND SUBCATEGORIES:

PRODUCT:
- CNST Construction
- TOPS Traffic Operations
- PREV Preservation (Resurfacing)
- BRDG Bridge
- ROW Right-of-Way
- PTO Public Transportation Operations
- TRTF Toll Facilities Revolving Trust Fund
- 2080 Special Local Gov't program
- EDEV State Economic Development Program

SUPPORT:
- PEI Preliminary Engineering (In-house)
- PEC Preliminary Engineering (Consultant)
- CEII Construction Engineering and Inspection (In-house)
- CEIC Construction Engineering and Inspection (Consultant)
- RWII Right-of-Way Support (In-house)
- RWO Right-of-Way Support (Consultant)
- M&R Materials and Research
- PLAN Planning
- PTOO Public Transportation Operations Support

MAINTENANCE AND OPERATIONS:
- RMNT Routine Maintenance
- TE Traffic Engineering
- TOLO Toll Operations
- MCC Motor Carrier Compliance

ADMINISTRATION:
- ADMN Administration
- FCO Fixed Capital Outlay

FUNDS:

I,ACI	Interstate, Advanced Const Int
IR,ACIR	Interstate Rehab, AC Int Rehab
O.F.A.	Other Federal Aid
100% FED	100% Federal Financing
100% STATE	100% State Financing
TURNPIKE	Financed with Turnpike Bonds
TOLL,LOC,OTHER	Toll, Local, or other financing
BOND	Bond Financed (not Turnpike)
above with"/ROW"	Indicates funds for Right-of-way
CSX	CSX Railroad Corridor Purchase

CASH FLOW CATEGORIES:
- Federal Aid Interstate Construction
- Other Federal Aid Construction
- Federal Aid Preservation and Traffic Operations
- Federal Aid Bridge Construction
- Federal Aid Rights-of-Way
- Consultants
- State Construction
- State Preservation and Traffic Operations
- State Bridge Construction
- Other Construction
- State Rights-of Way
- Public Transportation Operations
- Budget - Flow in Year of Commitment
- Other - Special Cash Flow Situations

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- Preparing a proposed program plan using separate spreadsheet software;
- Loading this program plan into the model, which is designed to accept the data through file combination functions;
- Observing resulting cash flow and other financial results; and
- Making adjustments to proposed program, fund, or other variables in an interactive process using summary graphics and charts for interpreting interim results until a satisfactory financial balance is achieved.

The Program Plan Model is a PC-based spreadsheet model that uses the program plan as a data base for amounts to be flowed. By using an aggregate approach not tied to specific projects, the Program Plan Model can be used in developing the program plan at a time when projects are not yet defined. This aggregate approach lacks the detail of a near-term, project-oriented model; however, a near-term model is developed using the Interactive Financial Planning System (IFPS) for projects that are under way. The results are reconciled to the aggregate model to ensure that planned programs are

linked to accounting system data. Both models are balanced to produce the same result in the near term.

The long-term model is easy to use on a PC and is exportable to district offices or other units that want or need to be involved. Program plan proposals can be analyzed in minutes, thus ensuring that program decisions are based on good financial information.

MODEL VARIABLES

Flow Rates

Once the categories are established and balanced to the program plan, each commitment in the plan is cash-flowed using formulas that attempt to estimate the payout that will result from annual commitments of the category type. The payouts are represented in the formulas as a percentage of the total annual commitment that would pay out in the year of commitment and each subsequent year until the full amount is flowed. The following is a typical flow formula:

Year	*Payout* (%)
1	20
2	50
3	25
4	5
Total	100

Note that these formulas attempt to flow the total dollar volume of a class of projects that might be committed in a year. Neither the number nor the specifics of projects are known; this knowledge is not needed to predict total cash flow successfully. A program that contains thousands of projects can be cash-flowed in the aggregate using this simple function for each group of projects to yield an acceptable bottom line result.

Much of the work that has been done on transportation cash flow has focused on the development of flow models for individual projects (*6,7*). However, when dealing with programs involving thousands of individual projects with varying payout characteristics, the payout model for individual projects becomes irrelevant and only the start and stop times and total cost for each project are needed. This aggregate approach, in addition to being satisfactory from the standpoint of results, greatly reduces the data and processing time required to analyze specific scenarios. Also, factors other than the payout pattern of individual projects, such as participation ratios and receivables, may dominate the cash flow. Use of the model focuses attention on these factors. What may seem intuitively important at the beginning is often overshadowed by factors whose importance is not evident except through aggregate modeling.

Flow rates for past years can be derived from actual flow data in the process of developing and calibrating the model. Future rates can then be estimated on the basis of history as well as on planned policy actions that may affect the progress of programs. Budget or cash items are assumed to pay out in the year of commitment. A variables table in the model consists of a set of ratios, similar to those in the typical formula presented, for each of the cash flow categories presented in Table 2. A pictorial representation of the flow rates by year for one class of project—Interstate construction—is shown in Figure 1. Note that the rates vary slightly from year to year but that, overall, changes are gradual and can be related to specific payout history or projections of program commitment rates. In addition, separate rates for existing commitments for each category are included as variables. A method for tracking and adjusting rates on a continuing basis is a necessary part of the cash flow process.

Participation Ratios

Participation ratios are a set of factors for each year that estimate the extent to which federal funds will be used to finance a class of transportation projects. In the FDOT model, the classes used are (a) construction and (b) all other work, including planning, engineering, and right-of-way acquisition. These classes are used because of similar participation history

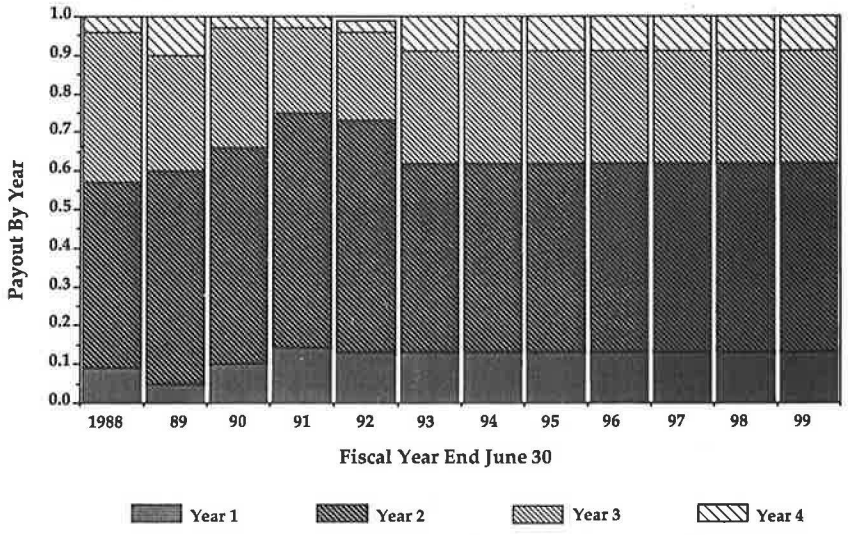

FIGURE 1 Flow rates (commitment payout) for Interstate construction.

and reporting practice. More recent versions of the model have refined the categories to isolate right-of-way and preliminary engineering.

Although the program plan is based on the year of commitment for product categories, participation rates refer to the ratios in effect at time of payment rather than commitment so that the latest available information concerning participation can be used and unplanned participation changes can be introduced into the analysis. The ratios are derived from studies of federal programming activity and current federal reimbursement experience and then input to the model. The monitoring, analysis, and management control of participation rates must be an integral part of the cash flow and financial planning process.

Federal Receivables

The model uses a federal aid receivables table that estimates, for each year, the amount of any federal participation that may be owed but for various reasons will not be collected. The extent of federal funds in the transportation budget requires that any fluctuation in the receivables balance be taken into account in the cash flow analysis. Any change in the balance, whether because of normal processing delay, a change in the level of those billings for which reimbursement is delayed or denied, or failure to submit reimbursement paperwork in a timely manner, must be estimated annually and introduced into the table. Further, any planned reductions to this balance must be accompanied by management action to cause the reduction to occur. Because the receivables balance can fluctuate by tens of millions of dollars in any year, this factor can easily overshadow many other elements of cash flow. Proper management of the receivables balance is an essential part of cash flow management.

MODEL CALIBRATION AND RECONCILIATION

The Program Plan Model was calibrated to actuals by requiring that the predicted payout in the various forecasting categories match the actual payout in those same categories for FY 1987–1988 and FY 1988–1989. The model began on June 30, 1987, with outstanding commitments in all categories. Flow rates for existing commitments were included as a variable. Actual commitments for the 2-year period were entered in the program plan, and new commitments were taken from the plan. Matching ratios for the 2 years were estimated. Existing and new commitment flow rates and participation ratios were then adjusted so that the projected cash flow by category was sufficiently close to actuals. The most recent version compared actual and projected cash flows to within 5 percent for any line item category that constituted 0.5 percent or more of total expenditures for the year.

In addition to calibrating the model for 2 years of actuals, the detailed, project-oriented, near-term model is compared with the long-term model for the 36-month period of the near-term forecast and calibrated to the same accuracy. The Program Plan Model can virtually duplicate actual cash flows and the cash flows projected by the more detailed near-term model. Program plans can then be developed using the long-term model and its gaming capabilities with assurance that a more refined analysis (the near-term model) would yield the same result.

MODEL OUTPUTS

Output from the model includes menu-selected graphics and printed schedules. Graphics provided in the basic model include the following:

- Cash flow charts;
- Commitments (total and by fund);
- Outstanding (unliquidated) commitments; and
- Federal aid receivables, payments, receipts, and matching revenues and expenditures.

Typical graphical output is shown in Figures 2 through 4. Figure 2 shows the overall cash balance of the State Transportation Trust Fund (STTF) by fiscal year compared with

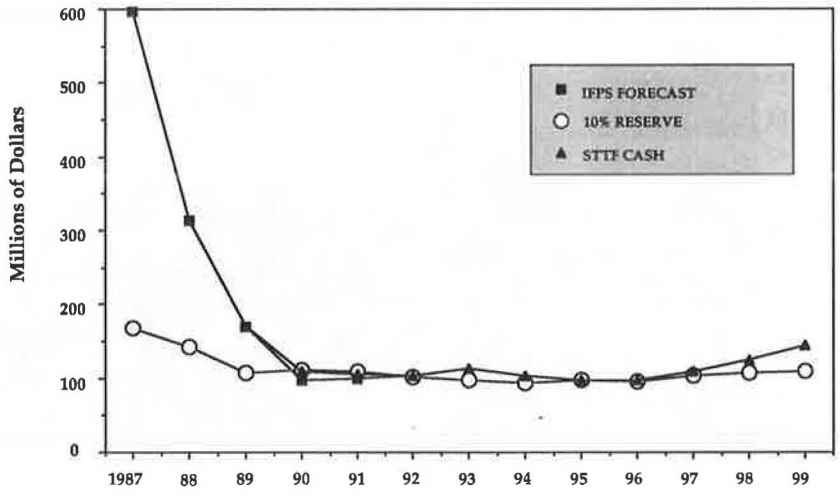

FIGURE 2 STTF cash flow.

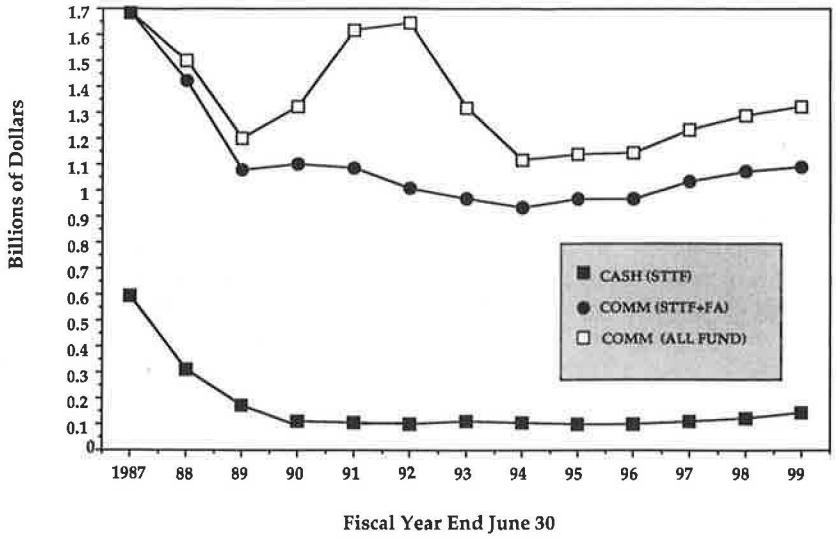

FIGURE 3 Outstanding (unpaid) commitments.

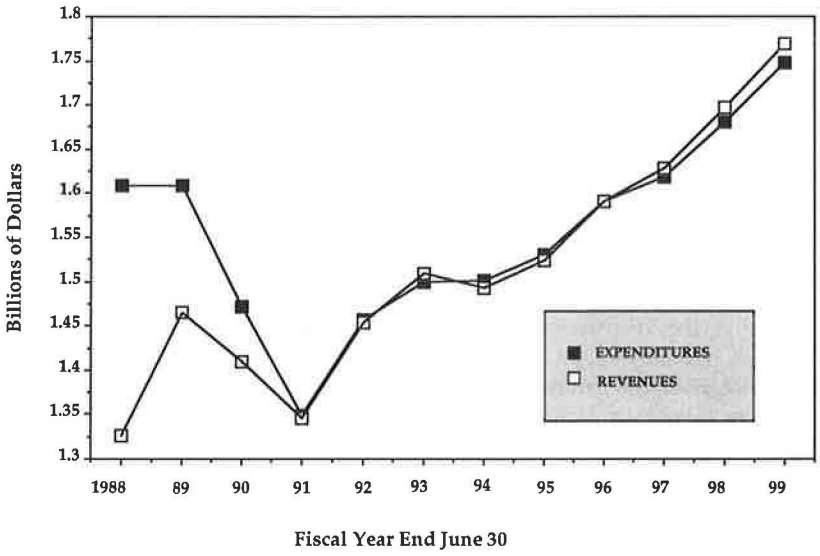

FIGURE 4 Revenues and expenditures.

the short-term forecast (IFPS) and a target cash balance set of 10 percent of outstanding commitments. The target balance is set to coincide with the end-of-year balance produced by the monthly short-term model. The graph in Figure 2 shows the result after imbalances have been corrected through interactive gaming. Figure 3 shows outstanding balances for various fund combinations, and Figure 4 shows a summary of overall revenues and expenditures.

The complete printed output of the model detailing the program input, cash flows, and summaries and balance checks, as well as other revenue and finance assumptions, consists of seven double-sized pages of computer output and provides a complete record of any particular scenario for analysis or recording. Included are the following:

- Program plan and cash flows,
- Variables,
- Commitment and cash flow summaries,
- STTF cash flow summary, and
- Reconciliation.

Other graphs and schedules for cross-checking totals and detailing federal aid, outstanding balances, and so forth are included in the printed output. Other tables and summaries may be developed as required.

MODEL DYNAMICS

The dynamics of interactive gaming to adjust programs, flow rates, matching ratios, and other variables to achieve a balancing to actuals or future available cash is not demonstrated by the final result charts included here. The interaction of these factors in a leveraged fund situation reveals character-

istics about the relationship among commitments, funds, and cash flow that are not apparent by any other means. The insights gained through the use of the model have had a major effect on program development strategies, particularly in the mix and timing of alternative programs, the control of federal participation, and the selection and implementation of cash control strategies. As an example, participation rates were low before use of the model, resulting in a greater expenditure of state funds than was forecast and thereby contributing to state transportation fund cash problems. Adjustment to the new rates was painful, requiring the deferral of projects, but the change resulted in a more realistic program.

TRACKING AND MONITORING

The development of a program plan balanced to actuals and to the more detailed near-term forecast does not ensure the accuracy of the result; rather, it ensures that the result is in balance with all known histories and systems affecting the overall financial picture. Once the model is set up and running, the actual experience of commitments and cash flow must be monitored and compared with planned and predicted experience, and appropriate adjustments must be made both to planned commitments and to predicted cash flows. The report used to accomplish this function is called the Program Plan Progress Report. It details actual commitments and expenditures by month, program, and fund. A preliminary summary report for fiscal year 1989–90, without the detail by program and fund, is presented in Table 3. The report should be reviewed monthly or as often as new data are produced from the accounting system that verifies or corrects the forecast. Several cycles of forecasting, monitoring, and adjusting are required to forecast accurately. Even then, during periods of major change in any of the factors affecting finance, adjustments may be required in programs, flow rates, and matching ratios, and possibly in the set up and structure of the model itself.

OTHER USES OF THE MODEL

District Planning

As previously explained, the Program Plan Model is a spreadsheet (LOTUS) application that can be used on most PCs. It can thus be transmitted to districts or other organizational units to provide them with the ability to analyze the total FDOT program plan. If the program plan is segregated into district or other components, analysis and gaming of those components can be performed. Although cash flow and management of the STTF fund must include the total department and are therefore centralized, districts benefit greatly by having the capability to analyze and game with their own programs and to quickly determine the impact on their portion of the total cash. Given a theoretical cash target as the objective, many variations of the program can be tested to meet that objective. The primary benefit of the model to the districts, however, is in resource planning.

Resource Planning

Resource planning is the process of balancing manpower, money, time, or other resources to ensure that the availability of resources is not exceeded and that available resources are used effectively. Because the Program Plan Model incorporates the proposed program plan and budget, from which work programs will be built, and because the data are arrayed in program plan format compatible with the needs of resource planning, the model can be used to analyze resource relationships. The work would involve constructing charts, ratios, or other analysis aids from data in the model. Examples of analyses that have been performed include the following:

- Compare in-house preliminary engineering capability with that proposed in the program plan. Does the plan require additional people?
- Is there enough work for in-house forces?
- What portion of the engineering effort is planned to be performed by consultants? Is the total (in-house plus consultant) engineering effort balanced to the task as defined by the program plan?
- What will be the cost of engineering per dollar value of construction work designed? What is the in-house cost? What is the consultant cost?
- Perform the preceeding analyses for construction supervision.
- Are the amount and costs of rights-of-way in reasonable balance with the work program as proposed in the program plan?
- Are available federal aid and state funds used to maximum benefit for the districts?
- Are the rates of increase or decrease of costs for administration, operations, organizational budgets, program growth, and so forth consistent with past experience, or are the reasons for significant change understood and defensible?

These questions and problems are only samples of the many matters that must be resolved in developing a balanced, financially sound program. The Program Plan Model provides a flexible, compact data source from which to perform this work.

SUMMARY

The FDOT Program Plan Model provides a framework to incorporate all of the complex financial factors involved in transportation finance activity, such as program and fund changes, budget changes, flow rates, matching ratios, participation rates, federal receivables, and so forth, so that the relative contribution of any variable to the bottom line can be immediately evaluated, tested, and used in gaming activities. The model provides a means to quickly determine the financial impact of any budget or program decision on an interactive trial-and-error basis. Because it is balanced and reconciled to more detailed near-term processes, the resulting decisions will be consistent with accounting and programming systems. The model can be used not only to evaluate proposed or actual changes but also to optimize the programming of available resources, plan resources (e.g., manpower, con-

TABLE 3 PROGRAM PLAN PROGRESS REPORT

PROGRAM PLAN PROGRESS REPORT
(* = Variance > + or - 10%)

PLAN: ADOPT90F PROGRAM YEAR 1989-90	COMMITTMENTS PriorYr Actual	CurrentYr Planned	PROGRESS AS OF JUNE 30,1990 COMMITTMENTS Planned	Actual	Var %	CASH FLOWS (ALL FUNDS) Planned	Actual	Var %	CASH FLOWS (STTF ONLY) Planned	Actual	Var %
I. PRODUCT	738.0	1136.7	1136.7	976.0	-14% *	834.6	726.0	-13% *	410.8	418.0	2%
A. Expessway Const.	345.4	229.0	229.0	240.0	5%	292.3	205.0	-30% *	100.0	99.0	-1%
B. Arterial Highways	115.6	157.8	157.8	152.0	-4%	159.2	170.0	7%	150.0	140.0	-7%
C. Right Of Way	26.4	422.0	422.0	300.0	-29% *	162.0	136.0	-16% *	63.0	75.0	19% *
D. Aviation	34.5	44.8	44.8	42.0	-6%	40.0	38.0	-5%	12.0	11.0	-8%
E. Transit	24.7	22.8	22.8	20.0	-12% *	18.0	17.0	-6%	5.0	6.0	20% *
F. Rail	50.6	45.2	45.2	30.0	-34% *	50.0	48.0	-4%	35.0	38.0	9%
G. Safety	13.9	10.7	10.7	10.0	-7%	10.5	5.0	-52% *	4.0	4.0	0%
H. Resurface/Rehab	34.7	55.0	55.0	52.0	-5%	18.5	19.0	3%	12.0	15.0	25% *
I. Bridge	92.2	149.4	149.4	130.0	-13% *	84.1	88.0	5%	29.8	30.0	1%
II. PRODUCT SUPPORT	316.9	271.2	271.2	275.0	1%	256.2	280.0	9%	172.0	174.0	1%
A. Preliminary Eng.	147.1	103.0	103.0	120.0	17% *	150.2	175.0	17% *	112.0	110.0	-2%
B. Const.Eng.Inspect.	74.0	72.5	72.5	72.0	-1%	40.0	50.0	25% *	25.0	28.0	12% *
C. R/W Support	41.1	46.7	46.7	38.0	-19% *	25.0	20.0	-20% *	12.0	12.0	0%
D. Material & Research	28.2	24.4	24.4	24.0	-2%	22.0	20.0	-9%	10.0	12.0	20% *
E. Planning	21.4	18.8	18.8	17.0	-10% *	15.0	12.0	-20% *	10.0	11.0	10% *
F. Public Transit Oper	5.1	5.8	5.8	4.0	-31% *	4.0	3.0	-25% *	3.0	1.0	-67% *
III.OPERAT.& MAINT.	263.4	241.5	241.5	239.0	-1%	231.0	223.5	-3%	220.0	219.0	0%
A. Routine Maintenance	170.4	159.4	159.4	160.0	0%	155.0	150.0	-3%	150.0	149.0	-1%
B. Traffic Engineering	10.9	10.8	10.8	8.0	-26% *	8.0	7.0	-13% *	4.0	5.0	25% *
C. Toll Operations	73.6	61.9	61.9	62.0	0%	60.0	58.0	-3%	58.0	58.0	0%
D. Motor Carrier Comp.	8.5	9.4	9.4	9.0	-4%	8.0	8.5	6%	8.0	7.0	-13% *
IV. ADMINISTRATION	51.4	58.7	58.7	55.0	-6%	55.5	52.0	-6%	51.0	52.0	2%
A. Administration	44.0	53.9	53.9	52.0	-4%	50.0	48.0	-4%	47.0	48.0	2%
B. Fixed Capital	7.4	4.8	4.8	3.0	-38% *	5.5	4.0	-27% *	4.0	4.0	0%
V. LOCAL GOV'T REIMBURSE	0.0	0.0	0.0	0.0		5.0	5.0	0%	5.0	5.0	0%
TOTAL PROGRAM	1369.7	1708.1	1708.1	1545.0	-10% *	1382.3	1286.5	-7%	858.8	868.0	1%
VI. OTHER	94.1	107.1	107.1	92.0	-14% *	100.0	99.0	-1%	100.0	99.0	-1%
A. Dept. Data Center	13.1	12.2	12.2	12.0	-2%	11.0	10.0	-9%	11.0	10.0	-9%
B. Mobile Equip.(CME)	52.2	45.9	45.9	46.0	0%	29.0	28.0	-3%	29.0	28.0	-3%
C. Non-Oper.Transfers	28.8	55.0	55.0	40.0	-27% *	50.0	55.0	10% *	50.0	55.0	10% *
D. Offset-Pay Package	0.0	-6.0	-6.0	-6.0	0%	6.0	4.0	-33% *	6.0	4.0	-33% *
TOTAL BUDGET	1463.8	1815.2	1815.2	1637.0	-10% *	1482.3	1385.5	-7%	958.8	967.0	1%

sultants, and money) to match work programs, maximize contracting power with available funds, analyze work programs from the standpoint of geographical and financial equity, optimize the use of federal aid, and conduct numerous other activities of top-level management.

In March of 1990, the model had already been in use for 1 year. Since that time, the following improvements have been made:

- Modification of the short-term model to report in program plan format for one-to-one reconciliations;
- Expansion of participation categories to separate engineering, right-of-way, and construction;
- Expansion of cash flow categories; and
- Other changes to refine the forecast and improve integration with the accounting systems.

While these minor changes were being made, the department developed 57 different program plan scenarios to accommodate the legislature and others seeking ways to improve transportation in Florida. An increase in taxes was the final result. Throughout this period, the model was the basis

for evaluating the financial impact of all scenarios and is now being used to guide everyday financial decisions and to analyze the financial impacts of the current national economic situation.

Although additional refinements will undoubtedly continue, the model has proven essential in providing top management and the legislature with a means to evaluate future program plans and work programs and to identify and guide systems changes for improvement. The process has fully integrated the planning, work program, and accounting systems—a necessary requirement for operating effectively in a cash flow environment.

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