In Calendar Year (CY) 1993, a total of 206.4 million tax returns are projected to be filed at Internal Revenue Service (IRS) service centers [1]. This is an increase of 1.6 percent over the number estimated to be filed in CY 1992. Return projections, developed by the IRS Research Division staff, provide a foundation for IRS resource requirements and budget submissions to the Department of Treasury, Office of Management and Budget and Congress. Calendar year projections reflect the year in which the returns are processed rather than the tax year [2]. Additionally, the projections account for recent administrative, regulatory and legislative changes. This article presents highlights of projection methodology, growth rates, projection accuracy and some discussion on the impact of electronic filing on individual returns.

**Projection Methodology**

Three distinctive methods were used to project tax returns: regression techniques, time series analysis and growth rates. Regression techniques were used when statistically sound relationships existed between tax return filings and independent economic or demographic indicators. The key economic and demographic variables which significantly affected return filings were personal income, gross domestic product (GDP), total employment, total population, the interest prime rate and household net worth [3]. These variables were used in regression models to project individual, employment, fiduciary and various corporation returns. In most instances, these economic or demographic variables were lagged by 1 year to correspond with the tax years, not the filing years. Also, “dummy variables” were occasionally used to account for the effects of legislative changes, return count aberrations and other unusual conditions not reflected by the economic or demographic variables.

The regression models incorporate the actual 1991 return count into the base period. Some also include 1992 estimates in the base period. Typically, the 6-month return count is used to estimate the total for the year based on the proportion of returns filed in 1992 relative to the same period in 1991.

In the absence of statistically sound relationships with economic and demographic variables, returns were projected using time series analysis: from finite moving averages, exponential smoothing and transfer function models to the more sophisticated autoregressive integrated moving average (ARIMA) technique. For example, for Forms 720 and 730, linear exponential smoothing and linear growth extrapolation, respectively, were used.

Simple growth rates are often used for forecasting when the return series has a short historical base period because the traditional projection techniques are not applicable. This method assumes that a prior growth pattern for a given form will continue in the future, or that a new return type will grow at the same rate as a related established return. Form 8752, filed annually by all partnerships and S Corporations electing either to maintain or establish a taxable year other than the required calendar year is a prime example of a new return projected using the growth rate of another return. In this instance, the combined Form 1065 (partnership) and Form 1120S (S Corporation) growth rate was used to project the Form 8752 volumes.

**Projection Highlights**

**Grand Total Returns, Primary Returns and Supplemental Documents**

The projections for the grand total of all returns call for an annual average increase of 1.8 percent for the years 1993 through 1999 (see Figure A). “Primary Returns,” particularly individual, corporation and employment tax returns, account for a major portion of the total filings and generate the majority of IRS document processing workload. Of the 206.4 million total returns projected to be filed in 1993, about 195.4 million were designated as Primary Returns and the remaining 11.0 million as “Supplemental Documents” (see Figure B). Supplemental Documents are mainly composed of amended returns and requests for filing extensions from both individuals and corporations [4].

**Individual Returns**

The total 1040 series (the sum of Forms 1040, 1040A and 1040EZ) comprises the bulk of total individual income tax returns. These returns are expected to reach nearly 117 million by CY 1993. Comparing the year-to-year percentage changes for the total 1040 series, the projections call for an increase of 1.5 percent in 1993 and 1.8 percent in 1994. Through 1999, the average annual growth rate in the series is 1.8 percent.

Individual returns account for over 56 percent of all returns expected to be filed in 1993. The IRS receives individual tax returns in a number of mediums, including,
conventional paper returns, electronically-filed returns, and the new Form 1040PC (which is now separately projected). Form 1040PC is a special condensed paper return generated by special tax preparation computer software. The IRS has also tested the filing of Form 1040EZ returns using touch-tone telephones under a new program called TeleFile (see Figure C).

Electronic filing was introduced to the public in 1986. In the first filing season, 25,000 returns were filed electronically in selected test areas in Ohio, North Carolina and Arizona. The program was expanded nationally in 1990 [5]. In 1992, over 11 million returns were electronically filed, which is 9.6 percent of all individual returns. In 1999, projections show that over 21 percent of all individual taxpayers will file electronically. Figure D graphically demonstrates the projected growth of electronically-filed returns in relation to all other individual income tax returns.

The official IRS reporting system counts most individual returns filed electronically (including Form 1040PC and TeleFile) as if they were Form 1040 returns. However, a 1992 analysis of electronically filed returns showed that almost 80 percent could have been filed on either the Form 1040A or the Form 1040EZ. These percentages are based on an analysis which determines the easiest type of paper return the electronic filer was eligible to file. Thus, the present accounting system over-
Projections of Returns to be Filed in Calendar Years 1993-1999

Figure C

<table>
<thead>
<tr>
<th>Filing methods</th>
<th>1992 Estimates</th>
<th>1993 Projections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic filing</td>
<td>11,068</td>
<td>14,755</td>
</tr>
<tr>
<td>TeleFile (in Ohio)</td>
<td>126</td>
<td>168</td>
</tr>
<tr>
<td>Form 1040PC</td>
<td>1,481</td>
<td>6,610</td>
</tr>
</tbody>
</table>

states Form 1040 filings and understates Form 1040A and Form 1040EZ filings. This, in turn, has made it difficult to forecast true underlying filing patterns by individual form type.

In an effort to preserve underlying filing trends for forecasting purposes, IRS Master File data were adjusted to eliminate the effect of electronic filing. Total electronic filing was subtracted from Form 1040 return types and redistributed to Form 1040, 1040A and 1040EZ return types based on the type of form the taxpayer could have filed. The result of this redistribution is the construction of historical filing patterns as if electronic filing never existed. After projections of relevant return items were made, projections of electronic filings on Forms 1040, 1040A and 1040EZ were subtracted from projected individual Form 1040, 1040A and 1040EZ return types. Figure E represents the percentage of returns projected to be filed electronically in 1993 by estimated form type eligibility [6].

Individual Declarations of Estimated Tax
The Individual Declaration of Estimated Tax (Form 1040-ES) payment vouchers are filed when income is not subject to withholding (or if the tax withheld is expected to be inadequate). Income not subject to withholding includes income from self-employment, interest, dividends, rents and alimony. Estimated tax payments are usually made on a quarterly basis depending upon the date the income was received. The projections have a growth rate of 2.3 percent in 1993 through 1999. In 1993, about 36.8 million Form 1040-ES vouchers are projected to be filed, about 18 percent of the grand total of all returns. The Form 1040-ES projections are based on a time series model.

Fiduciary Income Tax Returns
Form 1041 is filed by a fiduciary to report the income of an estate or trust. Annual growth for this return type from 1993 to 1999 is expected to average 1.8 percent. This projected growth is more or less in line with the anticipated increase in household net worth (a measure of personal wealth).

Fiduciary Estimated Tax Returns
Form 1041-ES was created by the Tax Reform Act of 1986, which mandated that fiduciaries of estates and trusts make certain estimated income tax payments beginning with Tax Year 1987. In 1993, about 640,700 Forms 1041-ES are expected to be filed, with an average annual growth of 2.8 percent projected through 1999. These projections were created by regressing the ratio of Forms 1041-ES to Forms 1041 on the interest prime rate charged by banks.

Partnership Returns
U.S. Partnership Return of Income (Form 1065) is used to report income, deductions, credits and losses from the operation of a partnership. The purpose of this return is to show each partner's distributive share, to be reported on the individual (or other) income tax return. The projections show an overall consistent decline of 0.6 percent through 1996, and then a slower decline of 0.3 percent until 1999. Forecasts have been based on a time trend model for recent years.
Projections of Returns to be Filed in Calendar Years 1993-1999

Figure E

Estimated Percentage of Individual Income Tax Returns Filed Electronically, by Type of Return, Calendar Year 1993

<table>
<thead>
<tr>
<th>Form</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1040</td>
<td>21%</td>
</tr>
<tr>
<td>1040A</td>
<td>60%</td>
</tr>
<tr>
<td>1040EZ</td>
<td>19%</td>
</tr>
</tbody>
</table>

Corporation Income Tax Returns
Corporation income tax returns are the aggregate of Forms 1120 (U.S. Corporation Income Tax Return); 1120-A (U.S. Short-Form Corporation Income Tax Return); and various other forms filed by such entities as real estate investment trusts, insurance and investment companies, homeowners associations and others. The corporation category also includes tax returns filed by "S Corporations" (Form 1120S, U.S. Income Tax Return for an S Corporation) that are taxed through shareholders. In 1993, about 4.6 million returns are projected to be filed. The projected average annual percentage change in the number of returns through 1999 is 2.8 percent which reflects a combination of econometric regression models using GDP and time series techniques based on past filing experience.

Estate and Gift Tax Returns
Federal estate tax returns (Form 706) are filed to report the transfer of property at death. In 1987, the filing requirement threshold was increased to estates whose gross assets exceeded $600,000. Estate tax returns are expected to grow at a rate ranging from 7.7 percent in 1993 to 7.4 percent by 1999. The estate tax return total is the summation of the projections for three distinct size groupings of returns: gross assets under $1 million; between $1 million and $5 million; and over $5 million. The methodologies used for these projections were ARIMA, exponential smoothing and weighted moving average, respectively.

The Federal gift tax is imposed on the gratuitous transfer of real or personal property which exceeds a certain dollar amount. Generally, the person making the gift (the donor) must file Form 709 to pay the tax. The 1993 projections call for a 7.0 percent growth rate. The average annual growth rate for the period 1993-1999 is projected at 4.9 percent. These projections are based on a time trend based on earlier years.

Employment Tax Returns
Employment tax returns consist of Employer's Annual Federal Unemployment Tax Return (Forms 940 and 940EZ), Employer's Annual/Quarterly Federal Tax Return (Form 941), Employer's Quarterly Tax Return for Household Employees (Form 942), Employer's Annual Tax Return for Agricultural Employees (Form 943) and Employer's Annual Railroad Tax Return (Form CT-1). Overall, employment tax returns are expected to grow at an average rate of 0.8 percent. This sluggish growth largely reflects the forecasted growth pattern for civilian employment. The major contributor to the employment tax return total is Form 941. The 1993 projection figure for Form 941 represents 21.7 million of the total 28.8 million employment tax return total, or approximately 75 percent.

The methodology for the total employment figure is the summation of all of the forms listed above. The regression model for Forms 940, 940EZ, 941 and 941 PR/SS/E used civilian employment lagged by 1 year with the appropriate dummy variables. Forms 942, 943, 943PR and CT-1 were regressed on a time trend. The overall projections were a summation of all the employment forms listed above.

Tax-exempt Organization Returns
Total tax-exempt organization returns are a summation of Form 990, Return of Organization Exempt From Income Tax; Form 990EZ, Return of Organization Exempt from Income Tax (Short Form); Form 990C, Farmers' Cooperative Association Income Tax Return; and Form 990PF, Return of a Public Foundation, as well as Form 990T, for the tax on unrelated business income of exempt organizations, Form 4720, for certain excise taxes on charities and other exempt organizations and Form 5227, filed for split-interest trusts. In 1993, total tax-exempt organization returns are expected to grow 2.5 percent over 1992 to about 555,000 returns. The longer range projections for 1993 through 1999 call for an average annual growth of

ARIMA, exponential smoothing and weighted moving average, respectively.

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Projections of Returns to be Filed in Calendar Years 1993-1999

1.9 percent. A variety of forecasting methods was used for the five separate return forms. Forms 990, 990EZ, 990PF, 990T, 4720 and 5227 were regressed on a time trend. Forms 990C were regressed on the number of farm cooperatives and a dummy variable.

Employee Plans
Total employee plan returns, representing the sum of Forms 5500, Annual Return/Report of Employee Benefit Plan; 5500C/R, Return/Report of Employee Benefit Plan; and 5500EZ, Annual Return/Report of One-Participant ( Owners and their Spouses) Pension Benefit Plan are projected to reach 1.2 million in 1993, increasing to 1.5 million by 1999. The overall average growth rate from 1993 to 1999 is 3.1 percent.

Excise Tax Returns
Total excise tax returns processed by IRS are the sum of the following four categories of returns: (1) Form 11C (Special Tax Return and Application for Registry-Wagering); (2) Form 720 (Quarterly Federal Excise Tax Return); (3) Form 730 (Tax on Wagering); and (4) Form 2290 (Heavy Vehicle Use Tax Return). Form 720 and Form 2290 comprise the largest share of the total. Using the 1993 projected figures, these two forms together represent about 92 percent of total excise tax returns. Form 11C and Form 2290 were regressed on time trends. Form 720 and Form 730 used linear exponential smoothing and linear growth extrapolation, respectively. (Alcohol and tobacco tax forms are not processed by IRS and are therefore excluded from these projections.)

Form 8752
Form 8752 is filed annually by all partnerships and S Corporations electing either to maintain or establish any taxable year other than the calendar year required by the Tax Reform Act of 1986. Prior to 1991, Form 8752 was encompassed in the Form 720 volumes. Form 8752 projections were based on the combination of the growth rates of Form 1065 (Partnerships) and Form 1120S (S Corporations). The projected figure for 1993 is approximately 70,000 returns, reflecting a growth rate of 3.5 percent from 1992. In 1999, the number of returns projected is 83,100.

Supplemental Documents
"Supplemental Documents" are comprised primarily of amended returns and requests for filing extensions. In 1993, about 11.0 million supplemental returns are expected to be filed, representing a growth of 2.1 percent from CY 1992 which largely reflects recent growth rates.

Projection Accuracy
In addition to understanding the forecasting models and projected volumes, it is useful to consider the historical accuracy of past projections when evaluating future forecasts. Using the actual return counts for Calendar Years 1989 through 1991, two key measures of accuracy have been calculated -- the mean absolute error (MAE) and the mean absolute percent error (MAPE). The MAE is the average of the relevant "projection errors," regardless of whether the forecasts were overprojected or underprojected. The projection error is simply the actual result minus the projected volume. The MAE and MAPE values are grouped by time horizons. The time horizon is determined by when the forecast was made and for what future year. For example, a forecast for CY 1989 made in 1986 would be part of the "3 years ahead" time horizon. At each time horizon, the number of observations (N) was held constant at three [7]. Figure F shows the MAE and MAPE accuracy rates of projections at the national level.

For the grand total and the primary return total categories, the absolute percentage errors (MAPE's) are generally in the 1 to 2 percent range, regardless of the time

<table>
<thead>
<tr>
<th>Type of return</th>
<th>Mean absolute error (number of returns)</th>
<th>Mean absolute percentage error</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 year ahead</td>
<td>2 years ahead</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Grand total</td>
<td>1,773,433</td>
<td>3,586,533</td>
</tr>
<tr>
<td>Primary returns, total</td>
<td>1,812,133</td>
<td>2,106,333</td>
</tr>
<tr>
<td>Individual income tax</td>
<td>647,767</td>
<td>806,167</td>
</tr>
<tr>
<td>Partnership</td>
<td>140,333</td>
<td>270,033</td>
</tr>
<tr>
<td>Corporation income tax</td>
<td>103,200</td>
<td>112,467</td>
</tr>
<tr>
<td>Employment tax</td>
<td>324,700</td>
<td>361,967</td>
</tr>
<tr>
<td>Supplemental documents</td>
<td>1,273,233</td>
<td>2,147,633</td>
</tr>
</tbody>
</table>

Note: Number of returns is based on three observations and is not additive.
Projections of Returns to be Filed in Calendar Years 1993-1999

horizon. The total individual return projections have the lowest average MAPE, ranging from 0.4 percent to 0.7 percent. Supplemental documents are historically more volatile and thus more difficult to project, as illustrated by the 12.5 percentage for 1-year-ahead MAPE.

The complete set of projections for 1992 through 1999 by form type is presented in Table 1.

Notes and References

[1] The number of returns filed (as used in this article) represents returns processed at IRS service centers and posted to the Master File system during a calendar year. The IRS Master File system includes the Individual Master File (IMF), the Business Master File (BMF) and the Employee Plans Master File (EPMF).

The numbers do not include the information and withholding documents processed by the Service, such as interest and dividend statements on Forms 1099, and wage and tax statement on Forms W-2. Information and withholding documents contain data for use in the IRS programs that match information return data with what is reported on the income tax return and are not considered to be tax returns. Most information documents are received on magnetic tape and processed at the IRS Martinsburg (West Virginia) Computing Center. For information about information return projections, see Calendar Year Projections of Information and Withholding Documents for the United States and Service Centers: 1992-1999, Revision 8-92, Research Division, Internal Revenue Service, U.S. Department of the Treasury.

[2] All statistics are for the year in which the tax returns were processed by the Internal Revenue Service, stated on a calendar year basis, unless otherwise noted. The main calendar year projections discussed in this article are based on Calendar Year Return Projections for the United States, Regions, and Service Centers: 1992-1999, Revision 10-92, Research Division, Internal Revenue Service, U.S. Department of the Treasury. Final actual counts for Calendar Year 1992 were incomplete at the time this article was written. For complete, fiscal year counts, see Annual Report of the Commissioner and Chief Counsel, Internal Revenue Service, Fiscal Year 1992 (in preparation at the time this article was written).


Projections of Returns to be Filed in Calendar Years 1993-1999

Table 1.—Number of Returns Filed or to be Filed with the Internal Revenue Service, Calendar Years 1991-1999

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td>(7)</td>
<td>(8)</td>
<td>(9)</td>
<td></td>
</tr>
</tbody>
</table>

Grand total 1
Primary returns, total 4
Individual income tax, total 6
Includes Forms 1040, 1040A and 1040EZ, total 5
Form 1040...
Form 1040A...
Form 1040EZ...
Other 7...
Individual estimated tax 9
Fiduciary income tax 14
Fiduciary estimated tax 12
Partnership 12
Corporation income tax 9
Estates tax 10
Gift tax 9
Employment tax 8
Form 1042 7
Tax-exempt organization 8
Employee plan 8
Excise tax 11
Form 720 11
Supplemental documents, total 1
Form 1040X 13
Form 4984 12
Form 2688 14
Form 1120X 12
Form 7000 15
Form 1041A 17

1 Excluded from all totals are the following "Non-Master File" returns: Forms CT-2, 941M, 990B, and 1120-C-DISC. Also excluded are withholding and information documents, including forms such as W-2 and the 1099 series and related others.
2 Estimate, including that for some corporations, is based on returns processed through part of 1992. The actual number filed in CY 1992 was unavailable when this table was compiled.
3 Includes Forms 1040NR, 1040PR, 1040SS and 1040C; Form 1040X is included under "Supplemental documents," below.
4 Includes Forms 1041 and 1041S; Form 1041A is included under 1 Supplemental documents," below.
5 Includes Forms 1120, 1120A, 1120F, 1120H, 1120L, 1120POL, 1120S, 1120SF, 1120PC, 1120PR, 1120REIT and 1120R; Form 1120K is included under "Supplemental documents," below.
6 Includes Forms 940, 940EZ, 940PR, 941, 941E, 941PR, 941S, 942, 942PR, 943, 943PR and CT-1.
7 Annual Withholding Tax Return for U.S. Source Income of Foreign Persons.
8 Includes Forms 890, 990EZ, 990C, 990PF, 990T, 4720 and 5227.
9 Includes Forms 5500, 5500C, 5500EZ and 5500R.
10 Includes Forms 11C, 720, 730 and 2290; excludes Forms 11 and 5000-00 which are filed with the Bureau of Alcohol, Tobacco and Firearms, U.S. Department of the Treasury, instead of with the Internal Revenue Service.
11 Form 720 is filed by partnerships and S Corporations electing either to maintain or establish any taxable year other than the required calendar year.
12 Individual amended return.
13 Individual request for automatic filing extension.
14 Individual request for additional filing extension.
15 Corporation amended return.
16 Employee benefit plan explanation of required distributions.
17 Trust accumulation of charitable amounts.

NOTE: Detail may not add to totals because of rounding.