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Forecasting U.S. Trade in Services

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ABSTRACT

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This paper provides a set of forecasts of United States international trade in services, both at the aggregate level and for four subcategories. These sectors are: travel, which is mostly tourist expenditures; passenger fares, which is mostly passenger air transportation; transportation, other than passenger transportation; and other private services, including education, financial services, insurance, telecommunications, and business, professional and technical services. A forecasting model is constructed and estimated, based on conventional economic forces of supply and demand, dependent on cost variables and income variables as well as relative prices. For forecasting purposes, these variables are taken from the Michigan Quarterly Econometric Model of the U.S. Economy, a macroeconomic forecasting model with forecasts provided regularly by the University of Michigan Research Seminar in Quantitative Economics.

The equations of the services trade model are reported and discussed, and the performance of the estimated equations is evaluated. The quarterly forecast paths are provided for both aggregate and sectoral services trade, including exports and imports, through the end of 2001. Results indicate that imports will continue to rise over the forecast period, while exports, after remaining nearly stationary for several quarters in some sectors in 1999, will resume their rise thereafter. This forecasting work is to be continued, and it is suggested, in addition, that future research would be useful to explore the determinants of the production and sales of foreign services affiliates of U.S. parent companies.

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I. Introduction

Trade in services[1] is a major part of U.S. participation in the global economy. Since the mid-1980s, the dollar value of service imports has, on average, equaled more than 21 percent of the value of goods imports, while service exports have, on average, been 40 percent as large as goods exports. In calendar 1998, U.S. service exports, as measured in the balance-of-payments accounts, totaled $260.4 billion compared with $181.5 of service imports, yielding a U.S. trade surplus in services of $78.9 billion.[2]

The United States has been running a positive balance in service trade since 1974. In the late 1970s, the service balance was in the range of $4-$5 billion per year; during the 1980s, the annual service surplus was generally in the $12-$15 billion range; and by the late 1980s, service

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[1]We use the term *services* to refer exclusively to the services portion of what is reported as trade in goods and services. It does not include factor income, interest income, and the like that are part of the current account.

[2]Balance of payments figures are transaction-based and represent actual international payments for services. NIPA-based figures, used for National Income and Product Accounting purposes, differ from actual transactions primarily by including imputed values for financial services rendered in kind and gross two-way parent-affiliate transactions. NIPA figures are conceptually more compatible with other variables of the forecasting model and have therefore been used here for that purpose. We report transaction figures, however, and an adjusted transactions-based forecast, for ease of comparison with the more familiar numbers that are reported in the press.

trade was producing $20-$30 billion surpluses. The 1990s have seen a marked growth in service trade, with export growth outpacing import growth to generate service trade surpluses rising until 1998, as follows (annually, in billions of $s, transaction-based):

1990	1991	1992	1993	1994	1995	1996	1997	1998
$27.9	43.1	57.4	60.7	65.3	73.8	82.8	87.7	78.9

The economic and financial problems in the Asia-Pacific region have taken a toll on U.S. exports. This is especially true for goods exports, but service exports have been impacted as well. By mid-1997, service exports had grown to $263 billion at an annual rate, up from $232 billion a year earlier. Thereafter, service exports stalled, and they have remained essentially flat in the range of $255-$263 billion from the second quarter of 1997 (1997.2) to 1998.4. Only in 1999.1 does it appear that the upward movement may have resumed, reaching $266 billion. Service imports, on the other hand continued to rise throughout 1998, with the result that the balance of trade in services declined to an annual rate of under $74 billion in 1998.3. The balance picked up after that, reaching just over $79 billion as of the latest quarter (1999.1) for which we had data at the time that we initially drafted this study.

In what follows, we report on the construction of a forecasting model for U.S. international trade in services. The model builds upon the data and forecasts of the U.S. economy done by the Research Seminar in Quantitative Economics (RSQE) at the University of Michigan, from which we take our estimates of the paths that will be followed by the explanatory

variables in our model. The effects of these variables on prices and quantities of trade in services are estimated here using a standard theoretical framework of supply and demand that is described below in Section III, after first providing a brief review of the literature in Section II. Section IV discusses the data and our procedures for estimation, leading to discussion of the estimated equations themselves in Section V. The forecast is in Section VI, to which the reader may turn immediately if not interested in the details of the model. Section VI describes the inputs to the forecast as well as several perspectives on the paths that we forecast for both aggregate services trade and the four disaggregated categories of services that our model treats separately.

II. Literature Review

In the past two decades, there have been a number of econometric forecasting efforts for the United States that have dealt to some extent with services. Some of these studies have treated services in the aggregate or with limited disaggregation while others have combined goods and services for forecasting purposes.

Thus for example, Helkie and Hooper (1988) discuss the forecasting properties of the partial equilibrium model of the U.S. current account, known as USIT, which has been maintained at the Federal Reserve Board. The USIT model has provided input into the Federal Reserve Multi-Country Model (MCM) and the later version of the MCM model now known as FRB/Global. Hooper and Helkie (pp. 27-29) distinguished "other services receipts and payments," with the explanatory variables being income and relative prices and real merchandise trade volumes as a proxy for transportation services. The FRB/Global model was instituted in 1996 and is laid out in Levin et al. (1997). Other service receipts and payments are still treated in the aggregate, with separate equations for the volumes and price deflators.

Other forecasting work on U.S. services trade includes Helkie and Stekler (1996), Dunaway (1988), and Nedde (1992). Helkie and Stekler seek to allow for improvements in the data for aggregate services exports and imports by including dummy variables in the context of the FRB-USIT model noted above. Dunaway's partial equilibrium model of the U.S. current account distinguishes three categories of services receipts and payments, including travel and passenger fares, transportation, and other services. His model is designed to analyze the sources of changes in the U.S. trade balance, sensitivity to changes in key exogenous determinants, and the impact of the post-1985 real depreciation of the U.S. dollar. Nedde's quarterly model of the U.S. current account was designed for use in IMF projections associated with the *World Economic Outlook*. She used an error-correction methodology to identify the lag structure and capture longer-run supply effects more fully. Equations for services receipts and payments in the aggregate and their implicit deflators are estimated and included in the analysis and evaluation of the forecasting properties of the current-account model.

The models mentioned above relate either to the U.S. current account as such or to the current account as embodied in a more comprehensive model of the U.S. macro-economy. There are of course many existing macro-econometric forecasting models of the U.S. economy and other economies as well as a number of multi-country models. As far as we can tell from an examination of several of these models, it appears that exports and imports of goods and services are typically combined for estimating and forecasting purposes. Since our interest in this paper is to develop a disaggregated forecasting structure for the four main categories of U.S. services exports and imports, the aggregate research is not altogether helpful. We have had accordingly to tailor our research to capture the main determinants of the volume and prices of each of the U.S.

disaggregated services trade categories and to assess the forecast properties of the individual equations involved.

III. Theory

Our estimation and forecasting are based upon a simple and standard theoretical model of trade in services. We assume that services are supplied and demanded perfectly competitively in each country of the world, and that the services provided by different countries are to some extent differentiated (the Armington Assumption), so that services in the same industrial category may be both exported and imported by a country. This could reflect true product differentiation based on country of origin (national differences in airline service, for example), but it could just as easily reflect the necessary aggregation of different services into single data categories, within which the mix is different across countries.

On the supply side, we assume that services are provided at constant cost. This cost in turn depends on general cost conditions in the exporting country and, for some categories of services, on additional cost variables that may be appropriate such as the price of oil. The elasticity of supply, as implicit in the assumption of constant cost, is assumed to be infinite, so that the supply price does not rise or fall with the quantity supplied.

On the demand side, we assume that demands for services parallel demands for goods, responding positively to an aggregate income or output variable of the demanding (importing) country, and negatively to the price of the imported service relative to alternative services and goods. Income and price elasticities of demand are assumed finite and are estimated from the data. For most of the service categories, which are in the nature of final services, the driving

income variable is real GDP – U.S. or the "rest-of-world" – depending on whether the service is being imported or exported, respectively.

For both supply and demand, we also allow for additional sector-specific determinants as appropriate, letting the data dictate whether such variables actually do play a significant empirical role. For example, because transportation services are largely traded as a means to trading goods, demand in this sector is permitted to depend on exports and imports of goods.

Because we assume supplies to be perfectly elastic, the supply equations specify price rather than quantity. Demand equations then determine quantity as a function of this price and other variables. Since we are modeling international trade in services, not domestic transactions, suppliers' prices are naturally specified in their own currency, and these must be translated using exchange rates in order to enter demand functions.

In sum, then, our model of trade in any service sector, *i*, consists of the following two equations for U.S. exports:

$$p_i^X = S_i^X(c_i^U) \tag{1}$$

$$q_i^X = D_i^X(I_i^W, e^{\$} p_i^X / p_i^W) \tag{2}$$

Here, (1) is the export price equation representing domestic supply. p_i^X is the U.S. dollar price of exports in sector *i*, c_i^U includes one or more U.S.-based cost variables appropriate to the sector and measured in dollars, and S_i^X is the supply-price function, positively dependent on costs. Equation (2) is the export quantity equation based on foreign demand. q_i^X is the quantity demanded. I_i^W is an income variable measured in world currency (see below). $e^{\$} p_i^X$ is the export price from (1) converted to world currency with the exchange value of the dollar $e^{\$}$. This is entered relative to p_i^W, which is the world-currency price either of competing services or of

broader substitute goods and services. D_i^X is the demand function, depending positively on the first argument and negatively on the second. Additional variables are occasionally included in both of these function as needed for particular sectors, but (1) and (2) show the major economic effects that are included in the model.

For U.S. imports in service sector *i*, similar equations are used, the main difference being the source and currency denomination of the explanatory variables:

$$p_i^M = S_i^M(c_i^W) \tag{3}$$

$$q_i^M = D_i^M(I_i^U, p_i^M / e^{\$} p_i^U) \tag{4}$$

In the import price equation (3), the foreign-currency price of U.S. imports, p_i^M, depends on c_i^W, a measure of world costs relevant to sector *i*. In the import quantity equation (4), I_i^U and p_i^U are U.S. income and substitute price variables measured in dollars.

Functional Form and Lags

All of our equations are estimated in logarithms, thus imposing constant elasticities on the functions above. We also choose an error-correction formulation to capture the dynamic behavior that is omitted above. That is, we assume that each underlying functional relationship determines a target value of the variable, and that the actual variable moves a constant fraction θ of the distance toward that target each time period (quarter). Thus, for any variable *y* specified in logs as a function of explanatory variable *x* also in logs, $y=f(x)=a_0+a_1x$ such as any of those above, we assume that

$$y(t) = y(t-1) + a_2\Delta f(x(t)) + \theta\left[f(x(t-1)) - y(t-1)\right], \qquad with\, 0 < \theta < 1$$

or

$$\Delta y(t) = \theta a_0 + a_2 a_1 \Delta x(t) + \theta a_1 x(t-1) - \theta y(t-1) \tag{5}$$

In the standard theory of error-correction models, the coefficient a_2 should be unity, but we allow for a looser formulation which permits the instantaneous response to a variable to differ from the long-run, or equilibrium, response. The latter is given by a_1, which we measure by the ratio of the coefficient of x(t-1) to the absolute value of the coefficient of y(t-1), as estimated in equation (5). In the estimation of equation (5), the data can always choose a_2 to be essentially unity. That rarely happens, however, which indicates that the looser formulation of the error-correction model is generally preferred empirically.

IV. Data and Estimation

Most of the data for the model were already available in the RSQE database. These data, which extend on a quarterly basis from as early as 1976 to the present, are available from the authors on request.

Since the quality of the foreign data was suspect prior to 1980, we used the earlier data for those equations that required only U.S. explanatory variables. Equations for export prices (which depend on U.S. costs) and import quantities (which depend on U.S. incomes and prices) were therefore estimated on data from 1976 to 1996. Export quantities and import prices, both of which depend on foreign variables, were estimated on data from 1980 to 1996. All estimates were done using ordinary least squares.

Our procedure was to perform the estimation in two stages. We first estimated price and quantity equations for aggregated services trade. Then, after that was successful, we repeated the

process with the four disaggregated categories of services reported here. In the disaggregated estimates, we were better able to tailor the explanatory variables to the trade being estimated, using GDP for example as the income variable for travel and passenger fares, but an index of industrial production for transportation services. The export of transportation services, however, was better explained by industrial production abroad, rather than GDP. This is entirely reasonable since transportation services are used to move finished and semi-finished goods and raw materials, which is better measured by industrial production than by GDP.

In each stage, we began with a number of time series tests on the data to establish that they were co-integrated as expected. We then estimated the equations in the form suggested above by theory, but also with several lags of the explanatory variables to let the data determine the timing of their effects. We did a good deal of experimenting with different selections of the explanatory variables, including several that we thought might enter the equations but that, in most cases, failed to do so significantly. Once we had settled on the variables that seemed to provide the most explanatory power, we adjusted the lag structure to eliminate lagged variables that were not making a useful contribution. The end result is the set of equations reported in the Appendix, each of which we feel does at least an adequate job of fitting the data, and many of which perform extremely well. Before accepting the final form of each equation, we also tested its residuals to confirm, as a maintained hypothesis, that they were white noise.

V. Estimated Equations

The estimated equations are reported in detail in the Appendix, together with various measures of statistical performance. Table 1 collects the most important of the estimated coefficients for ease of comparison and to give an overview of the results.

With the exception of the price of other private services, we succeeded in each category of services in finding a cost variable with significant explanatory power for prices. On the export side, where costs originate in the U.S., the long-run elasticities except for the price of transportation are close to unity, suggesting that we have a good handle on costs. For transportation, the cost variable reported in Table 1 is the price of oil, and our equation also includes U.S. unit labor costs as an additional variable that plays a major role. The cost variables are mostly no less significant on the import side, but their long-run elasticities are smaller, suggesting that we were less successful in identifying foreign costs completely.

Our quantity equations show strong effects from the various income variables that we selected, not only statistically significant but also with long-run elasticities always above one. This is important, since it means that the demands for these traded services tend to grow as a fraction of the economy as incomes rise, accounting in part for the growth of services and services trade that has been observed over time.

The estimated effects of relative prices on demands for traded services are all significant on the export side but less so on the import side, where the data, coming from the U.S., are arguably better. The estimated elasticities suggest that import demands for services are often inelastic, especially in the short run, and that they are seldom very elastic even in the long run. This is largely similar to what has been found for trade in goods.

VI. Forecasts

Inputs

The outlook for service trade over the next several years will depend most heavily on three key factors: the strength of the U.S. economy, as measured by the growth of U.S. real GDP; the growth rate of America's major trading partners; and the international value of the U.S. dollar. The first two of these drive the income variables in the demands for service imports and exports respectively. The exchange rate contributes to the relative prices that matter for both. These and other needed inputs are processed through our econometric model to produce the forecast.

The model uses a trade-weighted average of real GDP in five countries to represent economic activity among U.S. major trading partners. The five countries defining the "rest-of-world" for this purpose are Canada, Mexico, Japan, U.K., and Germany. The exchange rate, or value of the U.S. dollar, that is used in the model is the Major Currencies Index published by the Federal Reserve Board. It is calculated as a trade-weighted average of the value of the U.S. dollar against the currencies of Canada, the Euro-11, Japan, the U.K., Switzerland, Australia, and Sweden.

For purposes of this forecast, we used input values generated in the May 1999 economic forecast published by the RSQE. Table 2 contains annual data on the three variables just discussed, taken from the RSQE forecast.

To characterize these and other inputs:

- The U.S. economy is expected to produce its third straight year of just about 4 percent real growth in 1999, followed by continued expansion at more sustainable rates close to 2 1/2 percent during 2000 and 2001. The U.S. inflation rate is

expected to remain moderate over the next few years, but to be increasing from the unsustainably low levels of the past two years during which U.S. inflation benefited from generally sluggish economic conditions abroad accompanied by declining commodity and finished goods import prices.

- The Japanese economy declined at an average annual rate of 3.1 percent from 1997.1 through 1998.4, and the near-term economic outlook for Japan remains highly uncertain. There is, however, growing evidence that the worst is over, and that the combination of financial reforms and fiscal stimulus policies put in place in late 1998 will be followed by an economic turnaround before the end of 1999. We project that Japanese output growth will reach a 2 percent pace during the second half of year 2000 and accelerate further to a pace above 2.5 percent by the second half of 2001.

- The U.S. four major, non-Asian trading partners -- Canada, Mexico, the U.K., and Germany -- grew at an average rate of nearly 2 1/2 percent during 1998, down from more than 4 1/2 percent during 1997. We expect a moderate further slowdown to about 2 1/4 percent for 1999, followed by a pick-up to more than 2 3/4 percent for 2000 and 2001.

- For our five-country aggregate, therefore, we expect only 1.5 percent growth in 1999, down from 2 percent in 1998, followed by an acceleration to 2.2 and 2.8 percent for years 2000 and 2001, respectively. One of the implications of this growth path is that the economies of U.S. major trading partners are not likely to contribute much to a real recovery in the U.S. export growth rate until well into the year 2000.

- The U.S. dollar has appreciated for three straight years, 1996 through 1998, as other countries ran into economic and financial difficulties and international investors turned increasingly to the U.S. economy in a "flight to quality" for their short term financial investment. In the context of sustained economic recovery abroad, generally calmer non-crisis conditions in financial markets, and the expectation of a continuing deterioration in the overall U.S. current account deficit, the trade-weighted value of the U.S. dollar is forecast to edge down during the second half of 1999 and to depreciate at 2-3 percent rates during the 2000-2001 period.

Forecast of Trade in Total Services

Table 3 contains the forecast of total service trade for calendar years 1999-2001, showing transactions-based service exports, service imports, and the balance of trade in services. The

table shows the data both as levels in billions of (current) dollars, and as year-to-year percent changes. For perspective, the table contains data for 1995-1998 as well.

The quarterly forecasts of total service trade are graphed in Figure 1, starting with actual first-quarter-1999 values of net exports, exports, and imports of services. Like the annual values in Table 3, these are in current dollars and include some slight upward trend due to inflation, but most of the increase shown is in fact real.

As noted above, for calendar 1998 service exports were reduced to less than a 1 percent growth rate, compared with the more than 8 percent growth rates in the two previous years. The recovery of economies abroad produced a partial recovery in service exports starting already in the first quarter of 1999. Service exports are forecast to expand by about 3½ percent in 1999 and 2000, and then to resume their almost 9 percent growth in 2001.

U.S. service import growth slowed somewhat to 6.4 percent for 1998, picking up a bit in the fourth quarter but slowing again in the first quarter of 1999. Unlike service exports, service imports are forecast to continue growing in excess of 6 percent in 1999, and then to grow much faster in 2000 and 2001.

As a result, the balance of trade in total services is expected to drop continuously throughout 1999, and to reach a low of just over $62 billion annual rate in the last half of 2000. This is down about 30 percent from 1997's level, but it turns around slightly in 2001.

In summary, our forecast of total service trade suggests that the reduced growth in total service trade, both gross and net, that was observed in 1998 was only temporary, although it will take some time for previous high rates of growth to resume. Growth of service imports will recover sooner than service exports, causing a decline in the U.S. service trade surplus through

the year 2000. By 2001, however, service exports will be growing significantly again, and the service trade surplus will begin then to increase.

Forecast of Trade in Services Sectors

Our model includes separate forecasting equations for four subcategories of service trade:

- Travel – mostly tourist expenditures
- Passenger Fares – mostly passenger air transportation
- Transportation – other than passenger transportation
- Other Private Services – includes education, financial services, insurance, telecommunications, and business, professional and technical services

Prices and quantities of service exports and imports were forecast for each of these service categories separately, the results then summed and scaled to obtain the forecast for total services reported above. Thus, the forecasts for total trade in services that we have just discussed were built up from our forecasts of trade in these four sectors, to which we now turn.

Tables 4-7 contain the forecasts on an annual basis for each of these categories, using the same format as Table 3. Figures 2-5 present graphs of the quarterly forecasts for each category.

As shown in Table 4 and Figure 2, the United States is a net exporter of travel services, which consists mostly of expenditures by foreign tourists in the U.S. (exports) and by U.S. tourists abroad (imports). The slowdown abroad reduced U.S. exports in 1998, while U.S. imports continued to grow, albeit at a slower rate. Our forecast shows both of these growing faster in 1999 and after, with imports of travel services recovering faster than exports, just as we noted above for trade in total services.

Trade in passenger fares, in Table 5 and Figure 3, slowed in both directions in 1998. That is, both exports and imports of passenger fares declined slightly. Exports in this category are forecast to hold essentially constant in 1999, then to resume substantial growth in 2000 and 2001. Imports of passenger fares pick up sooner than exports, growing already by more than 4 percent in 1999 and by over 10 percent in 2000. As a result, the trade balance in passenger fares – which is a small positive number throughout this period – declines by small amounts absolutely (and by large amounts percentage-wise) in 1999 and 2000, before rising in 2001.

Trade in transportation services (Table 6 and Figure 4) was already growing only rather slowly (compared to other categories of services) in 1996-97. Exports of transportation services then fell absolutely in 1998 due to the Asian crisis. Interestingly, our forecast shows both exports and imports increasing already in 1999 and growing steadily thereafter at rates above what were seen in the last few years.

Our last category of services, other private services, is reported in Table 7 and Figure 5. Here both exports and imports have grown very rapidly in recent years, and the problems of 1998 only reduced those annual rates of growth from double-digit to single-digit levels. Our forecast shows imports resuming rapid growth after the middle of 1999, while exports actually decline in late 1999 and grow hardly at all in 2000. By 2001, export growth will have picked up, but it will remain below the double-digit rates of a few years ago.

Together, these results for categories of services all show patterns that are similar to what we saw for total services, the differences across categories being primarily of timing and of degree. In particular, three of the four categories – all but transportation – show imports recovering sooner than exports from the decline that was seen in 1998, so that net exports decline

at least into the year 2000. Our disaggregated results do not suggest that any one sector is primarily responsible for what is observed at the aggregate level.

VII. Conclusion

Trade in services between the United States and the world has grown rapidly over the last decade and more, with both imports and exports expanding steadily. The Asian crisis cut into this growth to varying degrees in all of the sectors of services that we are able to distinguish in the data. Our forecasts consistently predict, however, that growth of services trade will resume, though in some cases after a delay of a year or two. In particular, we expect U.S. service imports to recover more rapidly than service exports, so that the large U.S. trade surplus in services will decline over 1999-2000 before beginning to rise again in the year 2001. Even with this decline, however, we do not expect U.S. net exports of services to fall below the more than $60 billion reached earlier in this decade.

Our effort to provide a forecasting structure for U.S. service trade will hopefully set an example for others to follow, both in the United States and in other major trading countries in which service trade is important. There is no doubt that more work needs to be done to improve the equations that we have constructed and estimated. We plan to continue our forecasting effort on a semi-annual basis for the next two years.

It should also be noted that we have concentrated on so-called cross-border service trade, leaving aside the very substantial magnitudes of international service transactions that are generated by the activities of the foreign affiliates of U.S. multinational corporations. Indeed, the level of U.S. service sales through foreign affiliates (establishment trade) amounted to $258 billion in 1997. It would be of interest accordingly to develop a framework that could be used to

identify the major determinants of the location and sales activities of these U.S.-owned services affiliates operating abroad and their foreign-owned counterparts operating in the United States and elsewhere.

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Table 1
Estimated Elasticities of Cost, Income, and Relative Price Variables
in Equations for Exports and Imports of Services

	Price Equations		Quantity Equations			
	Cost		Income		Relative Price	
	Short-Run	Long-Run	Short-Run	Long-Run	Short-Run	Long-Run
Exports						
Travel	0.64**	1.04	0.48*	2.18	-0.27***	-1.20
Pass. Fare	3.02***	1.21	0.63**	3.11	-1.79**	-1.28
Transport.	0.09***	0.35	1.38**	1.11	-0.34**	-0.22
Other	0.07***	0.92	0.80***	2.13	-0.31**	-0.33
Imports						
Travel	0.09**	0.40	1.40***	1.22	-1.02***	-1.04
Pass. Fare	0.12***	0.51	0.85**	2.09	-0.82	-0.53
Transport.	0.08***	0.56	0.31**	1.06	-0.43**	-1.29
Other	n.a.		0.82***	3.59	-0.16	-0.68

Stars indicate level of statistical significance of the short-run coefficients:
***=1%, **=5%, *=10%

Table 2
Inputs to the Forecast
Exchange Rates, U.S. and Foreign GDP
Actual and Forecast by RSQE Model, 1994-2001

	Actual				Forecast		
	1995	1996	1997	1998	1999	2000	2001
Trade-wtd. Value of Dollar 3/73=100	81.4	85.2	91.9	96.5	94.4	92.6	89.7
U.S. Real GDP	6761.8	6994.8	7269.8	7551.9	7851.9	8035.7	8237.0
Five-country real GDP 1992=100	105.7	108.7	112.8	115.1	116.9	119.5	122.8

	Percent Changes					
	1995-96	1996-97	1997-98	1998-99	1999-2000	2000-01
Trade-wtd. Value of Dollar 3/73=100	4.7	7.8	5.1	-2.2	-1.9	-3.1
U.S. Real GDP	3.4	3.9	3.9	4.0	2.3	2.5
Five-country real GDP 1992=100	2.9	3.8	2.0	1.5	2.2	2.8

Table 3
Total Services Trade
Actual and Forecast, 1995-2001
Transactions Based[a]
(Billions of Current Dollars)

	Actual				Forecast		
	1995	1996	1997	1998	1999	2000	2001
Services Trade Balance	73.8	82.8	87.7	78.9	75.7	63.1	66.4
Exports	219.8	238.8	258.3	260.4	269.4	278.7	302.9
Imports	146.0	156.0	170.5	181.5	193.6	215.6	236.5

	Percent Changes					
	1995 -96	1996 -97	1997 -98	1998 -99	1999- 2000	2000 -01
Services Trade Balance	12.1	6.0	-10.1	-4.0	-16.7	5.3
Exports	8.6	8.2	0.8	3.5	3.4	8.7
Imports	6.9	9.3	6.4	6.6	11.3	9.7

[a]Forecasts were done using NIPA data, then converted for this table to transactions basis by assuming that the ratio of transactions-based exports to NIPA-based exports remains constant over time at the level of 1998.

Table 4
Trade in Travel (Tourist Services)
Actual and Forecast, 1995-2001
(Billions of Current Dollars)

	Actual				Forecast		
	1995	1996	1997	1998	1999	2000	2001
Services Trade Balance	18.5	21.7	22.1	19.5	18.3	16.5	19.1
Exports	63.4	69.8	73.3	72.0	74.2	76.8	82.9
Imports	44.9	48.1	51.2	52.5	55.8	60.3	63.8

	Percent Changes					
	1995 -96	1996 -97	1997 -98	1998 -99	1999- 2000	2000 -01
Services Trade Balance	17.3	1.6	-11.5	-6.0	-9.9	15.6
Exports	10.1	5.0	-1.7	3.0	3.6	7.9
Imports	7.1	6.6	2.5	6.4	8.0	5.8

Table 5
Trade in Passenger Fares
Actual and Forecast, 1995-2001
(Billions of Current Dollars)

	Actual				Forecast		
	1995	1996	1997	1998	1999	2000	2001
Services Trade Balance	4.3	4.6	2.7	2.6	1.9	1.3	1.5
Exports	18.9	20.4	20.9	20.8	20.8	22.3	24.9
Imports	14.7	15.8	18.2	18.1	18.9	21.0	23.3

	Percent Changes					
	1995 -96	1996 -97	1997 -98	1998 -99	1999- 2000	2000 -01
Services Trade Balance	7.6	-41.8	-2.1	-29.0	-28.8	16.0
Exports	7.9	2.3	-0.6	0.0	7.3	11.6
Imports	8.0	15.2	-0.4	4.2	10.9	11.3

Table 6
Trade in Transportation Services
Actual and Forecast, 1995-2001
(Billions of Current Dollars)

	Actual				Forecast		
	1995	1996	1997	1998	1999	2000	2001
Services Trade Balance	-0.7	-0.7	-1.4	-2.6	-2.8	-3.4	-3.4
Exports	26.8	27.0	27.9	27.6	29.3	31.5	33.8
Imports	27.5	27.7	29.3	30.2	32.1	35.0	37.2

	Percent Changes					
	1995 -96	1996 -97	1997 -98	1998 -99	1999- 2000	2000 -01
Services Trade Balance	7.7	92.9	93.7	6.8	23.6	-2.1
Exports	0.8	3.3	-1.2	6.2	7.6	7.3
Imports	1.0	5.6	3.1	6.2	9.0	6.4

Table 7
Trade in Other Private Services
Actual and Forecast, 1995-2001
(Billions of Current Dollars)

	Actual				Forecast		
	1995	1996	1997	1998	1999	2000	2001
Services Trade Balance	28.1	32.1	38.4	38.9	38.4	30.9	30.3
Exports	63.6	70.9	82.2	85.8	88.6	89.6	97.7
Imports	35.5	38.8	43.8	47.0	50.2	58.6	67.5

	Percent Changes					
	1995 -96	1996 -97	1997 -98	1998 -99	1999- 2000	2000 -01
Services Trade Balance	14.1	19.7	1.2	-1.1	-19.4	-2.1
Exports	11.5	15.9	4.4	3.3	1.0	9.1
Imports	9.4	12.8	7.3	7.0	16.7	15.1

Figure 1
Quarterly Forecast of Total Trade in Services

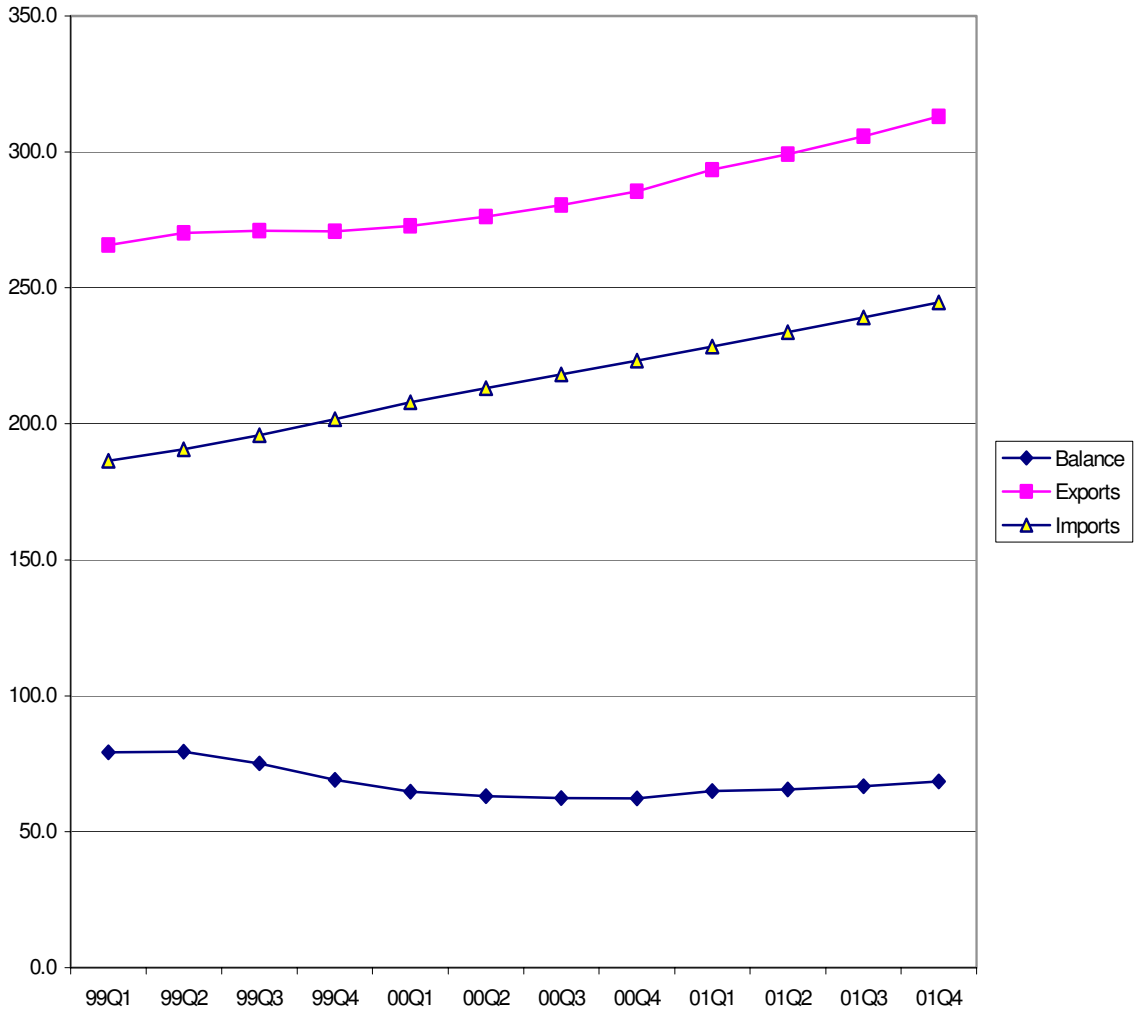


Figure 2
Quarterly Forecast of Trade in Travel Services

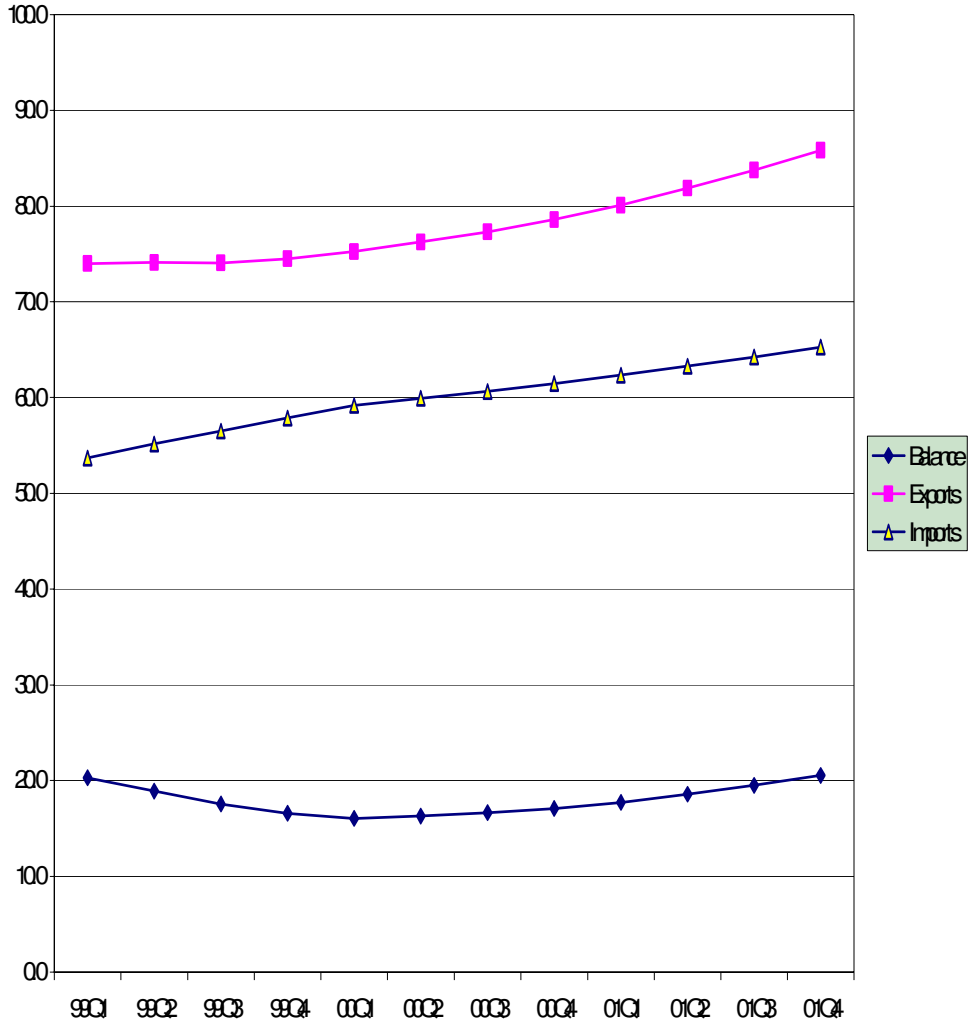


Figure 3
Quarterly Forecast of Trade in Passenger Fares

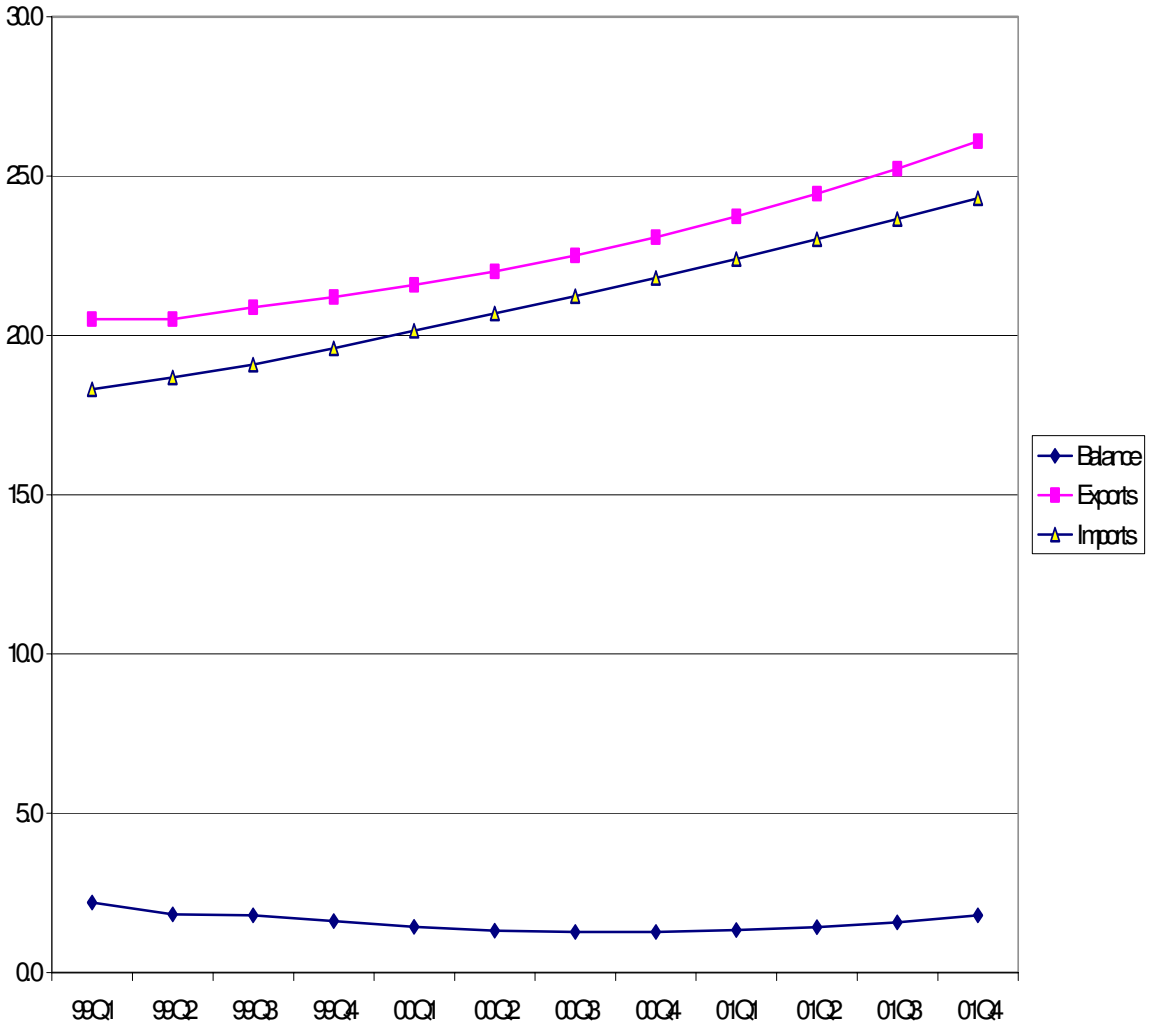


Figure 4
Quarterly Forecast of Trade in Transportation

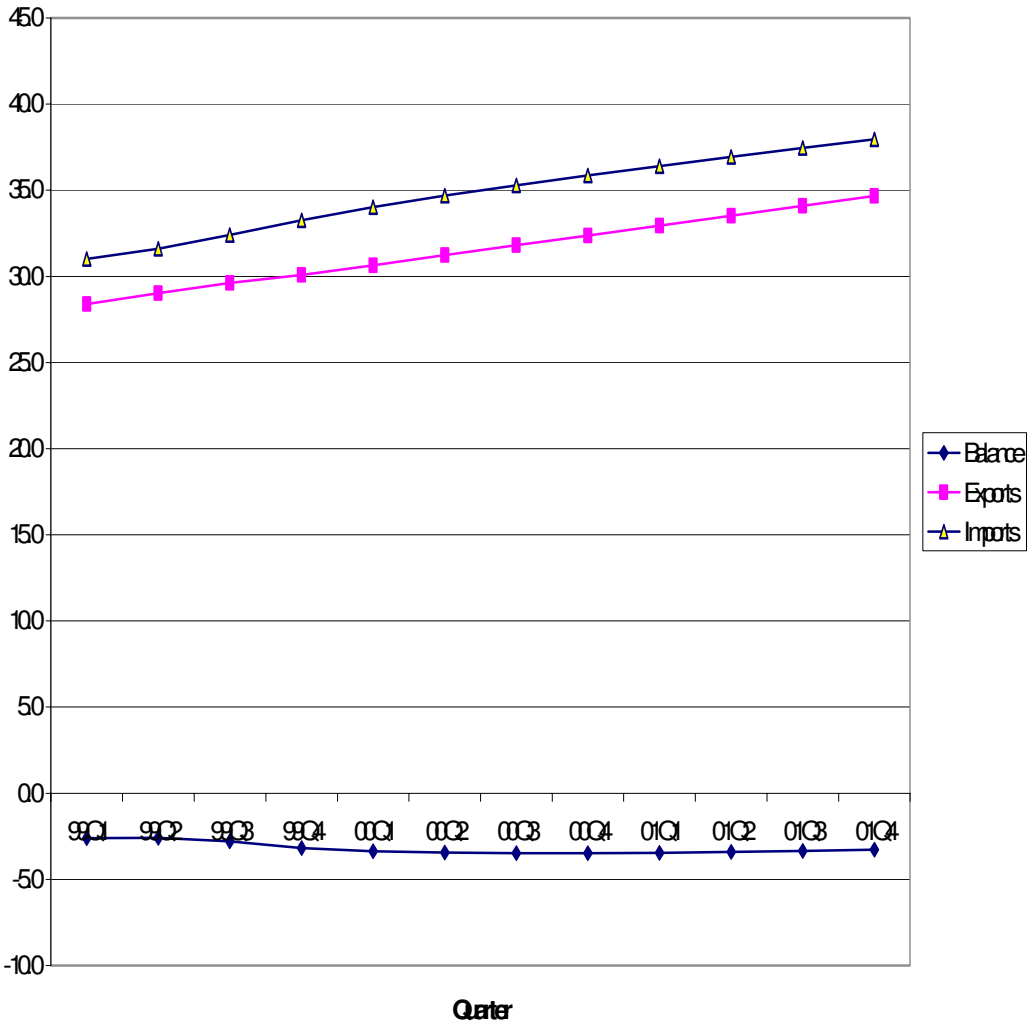
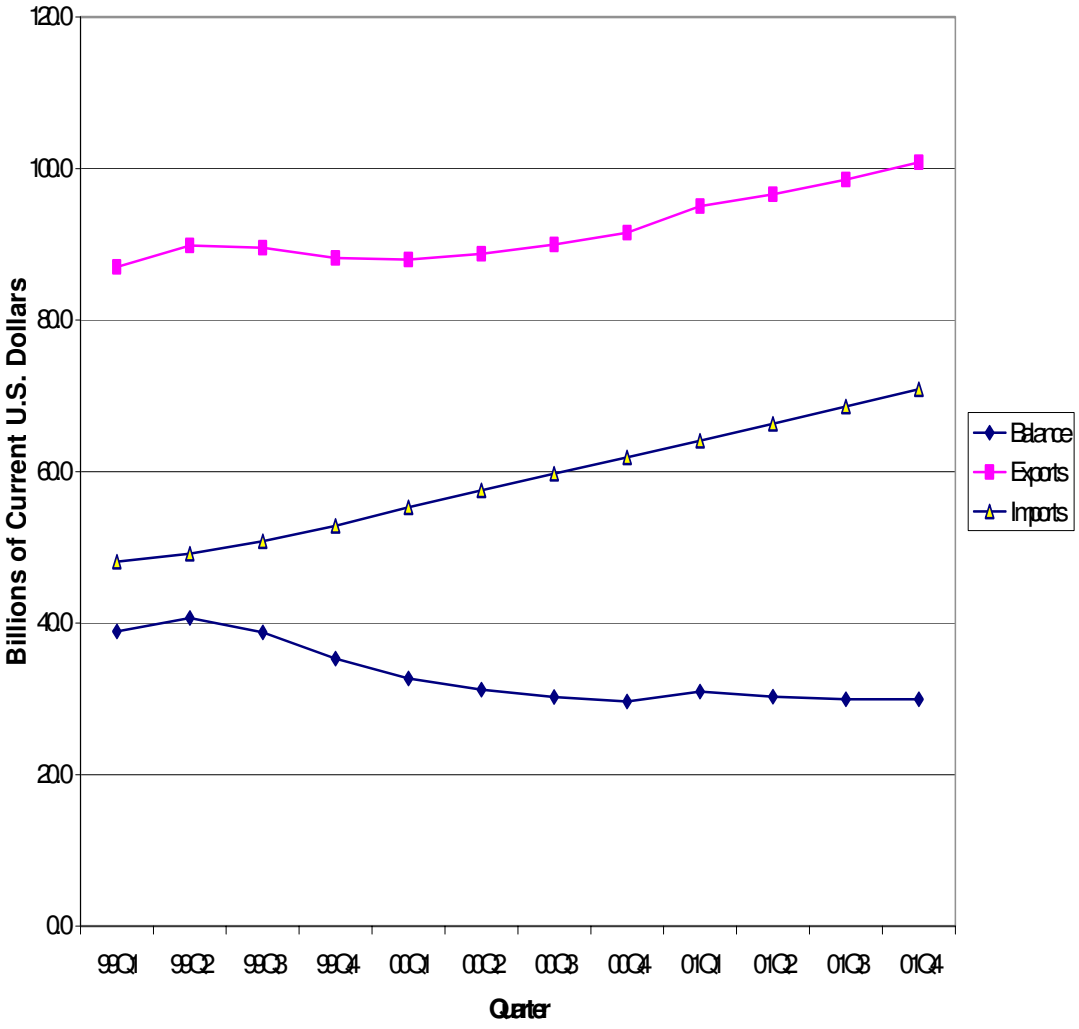


Figure 5
Quarterly Forecast of Trade in Other Private Services



APPENDIX

Equations of the Model

All export quantity and import price equations are estimated from 1980q2 to 1996q4, and all export price (except the passenger fare equation) and import quantity equations are estimated from 1976q2 to 1996q4. All estimates are obtained using ordinary least squares. Notation is defined at the end.

Numbers in parentheses are the standard errors of the estimated coefficients above them. Each equation is followed by the following diagnostic statistics

R^2: This measures the fraction of the variance in the data that the equation is able to account for, or "explain," over the sample period. An R^2 of 1.00 would be perfect. In time series equations like these, an R^2 above .9 is considered quite normal when the dependent variable is the level of a price or quantity. However, when the dependent variable is a quarterly *change* in price or quantity, as in our model, a considerably smaller R^2, in the range of .4 to .6, would be expected.

s.e.: This is the "standard error" of the equation, a measure of the "average" error (regardless of sign) in the fit of the equation to the observed values of the dependent variable. Its quantitative interpretation, however, depends on the units of measurement of the variable being explained. In all of our equations, which have the change in a logarithm (of price or quantity) as their dependent variable, the standard error is interpreted as the average or expected error (regardless of sign) that the equation makes in explaining the quarterly rate of change of price or quantity. Thus, a standard error of 0.03 indicates that the equation has an expected (or normal, or average) error of about 3 percentage points in explaining the quarterly percent changes in the price or quantity variable. In econometric work of this kind, standard errors in the range of 0.03 to 0.06 are quite common.

DW(0): This is the most relevant of several "Durbin-Watson Statistics" that can be calculated. It measures the extent to which the equation's residuals (errors) can be considered random over time. If the residuals exhibit a pattern (i.e., lack of randomness), this usually indicates that something systematic is not being accounted for in the equation. A DW(0) value that is not "close" to 2.0 usually indicates lack of randomness. In econometric work of this kind, DW(0) values between 1.5 and 2.5 are, from a practical perspective, "close" to 2.0.

Travel Services

Export Quantity: **xstrav92** = real exports of travel services

$$\Delta\log(xstrav92) = -0.2036 + 0.4803\log(gdprow4)_{-1} - 0.2674\log(pxstrav*jexrm/pcrow4)_{-1}$$
$$(1.0280)\quad (0.2535)\qquad\qquad (0.0815)$$

$$-0.2236\log(xstrav92)_{-1} - 0.1583\,d91q1 + 0.0795\,d84q1on + 0.2651\,d84q1$$
$$(0.0723)\qquad\qquad (0.0526)\qquad (0.0294)\qquad (0.0578)$$

$R^2 = 0.56$ s.e. = 0.051 $DW(0) = 2.46$

Export Price: **pxstrav** = price deflator of travel exports

$$\Delta\log(pxstrav) = -0.0506 + 0.0984\log(pcpi)_{-1} + 0.6395\,\Delta\log(pcpi) - 0.0943\log(pxstrav)_{-1}$$
$$(0.0323)\quad (0.0394)\qquad\qquad (0.1056)\qquad\qquad (0.0361)$$

$R^2 = 0.55$ s.e. = 0.006 $DW(0) = 1.88$

Import Quantity: **mstrav92** = real imports of travel services

$$\Delta\log(mstrav92) = -6.1320 + 1.0034\log(gdp92)_{-1} + 1.3989\,\Delta\log(gdp92)$$
$$(0.9671)\quad (0.1494)\qquad\qquad (0.4966)$$

$$-0.8513\log(pmstrav/ppnf)_{-1} - 1.0210\,\Delta\log(pmstrav/ppnf) - 0.8217\log(mstrav92)_{-1}$$
$$(0.1351)\qquad\qquad (0.1634)\qquad\qquad (0.1130)$$

$$-0.0689\,d91q1 + 0.3639\,d84q1on + 0.0536\,d84q1$$
$$(0.0374)\qquad (0.0547)\qquad (0.0644)$$

$R^2 = 0.77$ s.e. = 0.036 $DW(0) = 2.06$

Import Price: **pmstrav** = price deflator of travel imports

$$\Delta\log(pmstrav*jexrm) = +1.0889 + 0.0905\log(pcrow5)_{-1} + 0.0647\log(pmgoil*jexrm)_{-2}$$
$$(0.4463)\ (0.0272)\qquad\qquad (0.0217)$$

$$+0.0215\,[\log(pmgoil*jexrm) - \log(pmgoil*jexrm)_{-2}]$$
$$(0.0205)$$

$$-0.2273\log(pmstrav*jexrm)_{-1} - 0.0285\,d84q1on$$
$$(0.0646)\qquad\qquad (0.0128)$$

$R^2 = 0.22$ s.e. = 0.029 $DW(0) = 1.89$

Transportation Services

Export Quantity: **xstrans92** = real exports of transportation services

$$\Delta\log(xstrans92) = -0.3010 + 0.3356\log(jiprow5)_{-1} + 1.3756\,\Delta\log(jiprow5)$$
$$(0.5851)\quad(0.1660)\qquad\qquad(0.2680)$$

$$-0.0661\log(pxstrans*jexrm/pcrow5)_{-1} - 0.3371\,\Delta\log(pxstrans*jexrm/pcrow5)$$
$$(0.0309)\qquad\qquad\qquad\qquad(0.0898)$$

$$-0.3028\log(xstrans92)_{-1}$$
$$(0.0978)$$

$R^2 = 0.49$ s.e. = 0.024 $DW(0) = 2.19$

Export Price: **pxstrans** = price deflator of transportation exports

$$\Delta\log(pxstrans) = +0.2408 + 0.0289\log(pmgoil)_{-1} + 0.0922\,\Delta\log(pmgoil) + 0.2597\log(julc)_{-1}$$
$$(0.0682)\;(0.0087)\qquad\qquad(0.0181)\qquad\qquad(0.0641)$$

$$-0.3403\log(pxstrans)_{-2} - 0.0818\,[\log(pxstrans)_{-1} - \log(pxstrans)_{-2}]$$
$$(0.0793)\qquad\qquad(0.1049)$$

$R^2 = 0.43$ s.e. = 0.019 $DW(0) = 1.96$

Import Quantity: **mstrans92** = real imports of transportation services

$$\Delta\log(mstrans92) = -0.9557 + 0.1693\log(gdp92{-}x92) + 0.3056\,\Delta\log(xg92)$$
$$(0.4664)\;(0.0733)\qquad\qquad(0.1242)$$

$$-0.2064\log(pmstrans/ppnf)_{-1} - 0.4271\,\Delta\log(pmstrans/ppnf)$$
$$(0.0838)\qquad\qquad(0.1619)$$

$$-0.1604\log(mstrans92)_{-1} + 0.2919\,\Delta\log(mg92)$$
$$(0.0558)\qquad\qquad(0.1310)$$

$R^2 = 0.38$ s.e. = 0.030 $DW(0) = 2.20$

Import Price: **pmstrans** = price deflator of transportation imports

$$\Delta\log(pmstrans*jexrm) = +0.2303 + 0.0766\log(pcrow5)_{-1} + 0.0739\log(pmgoil*jexrm)_{-1}$$
$$(0.2934)\;(0.0221)\qquad\qquad(0.0148)$$

$$+0.0799\,\Delta\log(pmgoil*jexrm) - 0.1379\log(pmstrans*jexrm)_{-1}$$
$$(0.0277)\qquad\qquad(0.0350)$$

$R^2 = 0.40$ s.e. = 0.028 $DW(0) = 2.10$

Passenger Fare Services

Export Quantity: **xspf92** = real exports of passenger fare services

$$\Delta\log(xspf92) = \underset{(1.2867)}{-\ 1.1795} + \underset{(0.3038)}{0.6325}\ \log(gdprow4)_{-1} + \underset{(0.4308)}{1.1724}\ \Delta\log(jexrm)$$

$$- \underset{(0.1022)}{0.2595}\ \log(pxspf*jexrm/pcrow4)_{-1} - \underset{(0.5052)}{1.7922}\ \Delta\log(pxspf*jexrm/pcrow4)$$

$$- \underset{(0.0769)}{0.2034}\ \log(xspf92)_{-1} - \underset{(0.0586)}{0.2466}\ d91q1 + \underset{(0.0566)}{0.1535}\ d91q1_{-1}$$

$R^2 = 0.50$ s.e. = 0.054 $DW(0) = 2.33$

Export Price: **pxspf** = price deflator of passenger fare exports

$$\Delta\log(pxspf) = \underset{(0.0706)}{-\ 0.1772} + \underset{(0.0451)}{0.1985}\ \log(pcs)_{-2} + \underset{(0.8622)}{3.0227}\ [\log(pcs)_{-1} - \log(pcs)_{-2}] - \underset{(0.0470)}{0.1644}\ \log(pxspf)_{-1}$$

$R^2 = 0.36$ s.e. = 0.014 $DW(0) = 1.62$

Import Quantity: **mspf92** = real imports of passenger fare services

$$\Delta\log(mspf92) = \underset{(1.3418)}{-\ 3.0778} + \underset{(0.1743)}{0.4075}\ \log(gdp92)_{-1} + \underset{(0.6915)}{0.8548}\ \Delta\log(gdp92)$$

$$- \underset{(0.1023)}{0.1039}\ \log(pmspf/ppnf)_{-1} - \underset{(0.2555)}{0.8161}\ \Delta\log(pmspf/ppnf)$$

$$- \underset{(0.0796)}{0.1952}\ \log(mspf92)_{-1} - \underset{(0.0526)}{0.1494}\ d91q1 - \underset{(0.0535)}{0.1859}\ d84q1$$

$R^2 = 0.41$ s.e. = 0.050 $DW(0) = 2.19$

Import Price: **pmspf** = price deflator of passenger fare imports

$$\Delta\log(pmspf*jexrm) = \underset{(0.2678)}{+\ 0.6637} + \underset{(0.0283)}{0.1170}\ \log(pcrow5)_{-1} + \underset{(0.0197)}{0.0952}\ \log(pmgoil*jexrm)_{-2}$$

$$+ \underset{(0.0262)}{0.0387}\ [\log(pmgoil*jexrm)_{-1} - \log(pmgoil*jexrm)_{-2}]$$

$$+ \underset{(0.0263)}{0.0848}\ \Delta\log(pmgoil*jexrm) - \underset{(0.0478)}{0.2284}\ \log(pmspf*jexrm)_{-1} + \underset{(0.0286)}{0.0572}\ d91q1$$

$R^2 = 0.42$ s.e. = 0.024 $DW(0) = 1.70$

Other Private Services

Export Quantity: **xsopriv92** = real exports of other private services

$$\Delta\log(xsopriv92) = \underset{(0.9104)}{-\ 1.6608} + \underset{(0.2090)}{0.7966}\ \log(gdprow5)_{-1} \underset{(0.0527)}{-\ 0.1231}\ \log(pxsopriv*jexrm/pcrow5)_{-4}$$

$$\underset{(0.1071)}{-\ 0.2324}\ [\log(pxsopriv*jexrm/pcrow5)_{-2} - \log(pxsopriv*jexrm/pcrow5)_{-4}]$$

$$\underset{(0.1671)}{-\ 0.3061}\ [\log(pxsopriv*jexrm/pcrow5)_{-1} - \log(pxsopriv*jexrm/pcrow5)_{-2}]$$

$$\underset{(0.1447)}{+\ 0.2741}\ \max(jus.row - jus.row_{-1}, 0) \underset{(0.0631)}{-\ 0.3743}\ \log\ (xsopriv92)_{-1}$$

$R^2 = 0.43$ s.e. = 0.041 $DW(0) = 1.56$

Export Price: **pxsopriv** = price deflator of other private service exports

$$\Delta\log(pxsopriv) = \underset{(0.0178)}{+\ 0.0435} + \underset{(0.0270)}{0.0873}\ \log(julc)_{-3} + \underset{(0.0544)}{0.1976}\ [\log(julc)_{-1} - \log(julc)_{-3}]$$

$$\underset{(0.0835)}{+\ 0.0707}\ \Delta\log(julc) - \underset{(0.1102)}{0.3391}\ [\log(pxsopriv)_{-1} - \log(pxsopriv)_{-2}]$$

$$\underset{(0.0266)}{-\ 0.0954}\ \log(pxsopriv)_{-2}$$

$R^2 = 0.44$ s.e. = 0.006 $DW(0) = 1.87$

Import Quantity: **msopriv92** = real imports of other private services

$$\Delta\log(msopriv92) = \underset{(1.8146)}{-\ 6.3956} + \underset{(0.2280)}{0.8190}\ \log(gdp92)_{-1} \underset{(0.1662)}{-\ 0.1564}\ \log(pmsopriv/ppnf)_{-1}$$

$$\underset{(0.1058)}{-\ 0.5480}\ [\log(msopriv92)_{-1} - \log(msopriv92)_{-2}]$$

$$\underset{(0.0611)}{-\ 0.2280}\ \log(msopriv92)_{-2} + \underset{(0.0539)}{0.0705}\ d91q1$$

$R^2 = 0.29$ s.e. = 0.053 $DW(0) = 1.99$

Import Price: **pmsopriv** = price deflator of other private service imports

$$\Delta\log(pmsopriv) = \underset{(0.0526)}{+\ 0.2367} + \underset{(0.0338)}{0.0942}\ \Delta\log(pcrow5/jexrm)$$

$$- \underset{(0.1153)}{0.2666}\ [\log(pmsopriv)_{-1} - \log(pmsopriv)_{-2}] - \underset{(0.0116)}{0.0515}\ \log(pmsopriv)_{-2}$$

$R^2 = 0.28$ s.e. = 0.009 $DW(0) = 2.14$

Notation:

Variable	Definition
gdp92	US real GDP, in billions of 1992 dollars
gdprow4	average real gdp of 4 countries (UK, Germany, Canada, Japan)
gdprow5	average real gdp of 5 countries (4 plus Mexico)
jexrm	average real exchange rate of developed countries
jiprow5	index of average industrial production of 5 countries (UK, Germany, Canada, Japan, Mexico)
julc	index of US unit labor costs
jus.row	the ratio of the 3-month T-bill rate to the trade-weighted 3-month foreign interest rate
mg92	real imports of goods, billions of 1992 dollars
msopriv92	real imports of other private services
mspf92	real imports of passenger fare services
mstrans92	real imports of transportation services
mstrav92	real imports of travel services
pcpi	US consumer price index
pcrow4	average consumer price index of 4 countries (UK, Germany, Canada, Japan)
pcrow5	average consumer price index of 5 countries (4 plus Mexico)
pcs	price deflator for personal service consumption
pmgoil	price index of oil measured in US $
pmsopriv	price deflator of other private service imports
pmspf	price deflator of passenger fare imports
pmstrans	price deflator of transportation imports
pmstrav	price deflator of travel imports
ppnf	price index of US non-farm business
pxsopriv	price deflator of other private service exports
pxspf	price deflator of passenger fare exports
pxstrans	price deflator of transportation exports
pxstrav	price deflator of travel exports
x92	real export of goods and services, billions of 1992 dollars
xg92	real export of goods, billions of 1992 dollars

xsopriv92	real exports of private services
xspf92	real exports of passenger fare services
xstrans92	real exports of transportation services
xstrav92	real exports of travel services

Dummy Variables

d84q1	1 for 84q1, 0 otherwise
d84q1on	1 for 84q1 and after, 0 otherwise
d91q1	1 for 91q1, and 0 otherwise