EVALUATION OF ALTERNATIVE LOAN VOLUME FORECASTING MODELS FOR THE FEDERAL INTERMEDIATE CREDIT BANK OF ST. LOUIS

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There is a keen interest in and resource commitment to generating forecasts of agricultural time series, particularly prices (e.g., Bessler and Brandt; Brandt and Bessler; Harris and Leuthold; Just and Rausser; Kulshreshtha et al.). Many business forecasters use simple extrapolative models, while academic forecasters seem to prefer statistical forecasting techniques, such as econometric or time series analysis. The demand for agricultural forecasts does not solely lie in the realm of agricultural commodity prices, however. For instance, being able to predict future levels of debt can be useful to institutions involved in providing credit to farmers and agribusinesses. One such institution is the St. Louis Federal Intermediate Credit Bank (Bank). The Bank serves the Farm Credit System's Sixth District, which is comprised of Illinois, Missouri and Arkansas.

This study examines the performance of forecasting models used to forecast Sixth District change in outstanding non-real estate loan volume relative to a model currently used by the Bank. Models are chosen for their simplicity and economy. This approach is taken because efforts to improve the accuracy of forecasts with more sophisticated, expensive models has not been shown to produce forecasts that are superior to simpler models (e.g., Brandt and Bessler, Farmbank Research Service, Harris and Leuthold). Therefore, three forecasting techniques are examined: two individual methods--single equation econometric and univariate Box-Jenkins analysis--and a composite forecast approach.

A survey conducted by Farmbank Research Service (FRS) to ascertain the specific needs of Bank officers for projections of loan volume indicated that most Bank personnel would benefit from predictions of monthly loan volume over at least a 12 month planning horizon. There was a revealed need for point forecasts and forecasts of turning points and trend. Given these user needs, forecast performance is judged by comparing predicted to actual monthly change in outstanding loan volume using the following criteria: absolute and average absolute error, mean square percentage error (MSPE), and a measure of directional accuracy, turning point and trend prediction.

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Forecasting regional loan volume outstanding has received little attention, although econometric analysis of the U.S. demand for farm loans has been done by several agricultural economists (Herr, 1967 and 1975, Njinkeu, Lins). In the literature reviewed, only a study conducted by FRS for the St. Louis Federal Intermediate Credit Bank analyzed alternative regional loan volume forecasting models; that research examined three techniques for forecasting monthly loan volume in the Sixth District: uni- and multivariate auto-regressive integrated moving average (ARIMA and MARIMA, respectively) and an averaging technique. Regression methods were not analyzed. Statistics used to measure forecast performance were average absolute error, variance of forecast and incorrect turning point accuracy. The model that exhibited the best ability to project gross Bank loans outstanding for monthly intervals was an averaging model, which calculated average changes in loan volume over time. The averaging model also exceeded uni-and multivariate ARIMA models in turning point tracking. A conclusion drawn from the study was that a series of forecasts averaged together over time produced a combined forecast which was superior, in terms of accuracy and stability, to any one forecast by itself.[1]

Forecasting Techniques

Econometric

Equations 1 and 2 are loan volume dependent, monthly demand models.[2] Equation 1 is a serially corrected regression equation with current observations. Using generalized least squares (GLS) regression over the 84-month period from January, 1976 (7601) through December, 1982 (8212), results are:

$$
\begin{aligned}
LVO_t = \; & \underset{(-1.77)^{**}}{-48.24} \quad \underset{(-2.40)^{*}}{-.32CR_t} \quad \underset{(-2.80)^{*}}{-.009FLB_t} \quad \underset{(5.54)^{*}}{+85.71FCR_t} \\
& \underset{(-2.73)^{*}}{-30.93JAN_t} \quad \underset{(-.520)}{-5.40FEB_t} \quad \underset{(3.57)^{*}}{+37.58MAR_t} \quad \underset{(3.65)^{*}}{+39.89APR_t} \qquad (1) \\
& \underset{(4.27)^{*}}{+47.34MAY_t} \quad \underset{(6.87)^{*}}{+74.85JUN_t} \quad \underset{(5.37)^{*}}{+58.25JUL_t} \quad \underset{(4.64)^{*}}{+51.48AUG_t} \\
& \underset{(3.75)^{*}}{+40.41SEP_t} \quad \underset{(-1.87)^{**}}{-24.65OCT_t} \quad \underset{(-4.21)^{*}}{-43.74NOV_t}
\end{aligned}
$$

*significant at the 5 percent level

**significant at the 10 percent level

where $R^2 = .89$, $F = 32.42$ and Durbin Watson = 1.97. LVO is the monthly change in loan volume outstanding and is measured in millions of dollars (nominal). Its value is the difference in loans outstanding at the end of any month and the corresponding value at the beginning of that month. The regressor set is comprised of cash receipts from farm marketings in the Sixth District, CR, refinancings from the Sixth District Federal Land Bank, FLB, the cost of funds obtained from Sixth District commercial banks relative to the cost of funds from the Sixth District FICB, FCR, and monthly seasonal dummy variables, JAN . . . NOV. CR and FLB are expressed in millions of dollars and their hypothesized sign is negative. FCR is given by the ratio of the average monthly commercial bank prime interest rate for the Sixth District to the average monthly interest rate charged by the Sixth District FICB. Relative cost of funds and change in loan outstandings are hypothesized to be positively related. The introduction of a time component is explained by the seasonality that dominates Sixth District farming activities. It is hypothesized that a dummy variable's coefficient is negative during harvest and immediately thereafter; farmers traditionally pay their debt at this time, thus loan outstandings decrease. The t-values in parentheses indicate that the relationships of the explanatory variables to change in loan volume outstanding are reliable at the five or ten percent significance level except for the February dummy variable. Signs are as expected. Data used (throughout the research) were provided by the Economic Research Service (USDA) and Sixth District FICB.

Equation 2 is a serially corrected regression equation that expresses monthly change in loan volume outstanding as a function of the monthly dummy variables only. Again, the period of fit is January, 1976 through December, 1982. Using a GLS estimator, the estimated model is:

$$\begin{aligned} LVO_t = \; & \underset{(.22)}{1\ .94} \quad \underset{(-4.79)^*}{-43.39JAN_t} \quad \underset{(-1.09)}{-11.85FEB_t} \quad \underset{(2.53)^*}{+29.37MAR_t} \\ & \underset{(2.77)^*}{33.15APR_t} \quad \underset{(3.01)^*}{+36.50MAY_t} \quad \underset{(4.07)^*}{+49.57JUN_t} \quad \underset{(2.87)^*}{+34.74JUL_t} \qquad (2) \\ & \underset{(2.64)^*}{31.55AUG_t} \quad \underset{(1.49)}{+17.22SEP_t} \quad \underset{(-5.47)^*}{-58.33OCT_t} \quad \underset{(-7.52)^*}{-65.34NOV_t}. \end{aligned}$$

*significant at the 5 percent level

$R^2 = .75$, $F = 13.65$ and $DW = 2.01$. T-values indicate that all coefficient values are significant at the five percent level except February and September. Signs are as anticipated.

ARIMA

An alternative forecasting technique is Box-Jenkins univariate time series analysis. It takes into account past behavior of the time series and current and past errors.

Using the methods of Box and Jenkins, the following purely autoregressive ARIMA model (i.e., MA = 0) was specified for monthly change in loan volume outstanding:

$$(1 + \underset{(-2.15)}{.30}B^{13})(1-B)(1-B^{12})LVO_t = a_t \qquad (3)$$

where B is the backward operator ($B^i LVO_t = LVO_{t-i}$) and a_t is a random disturbance. The model was estimated over the period 7601 to 8212. The chi-square statistic associated with the estimated residuals was under the critical value at the five percent level of significance as is the t-ratio associated with the autoregressive component.

Composite Model

Forecasters and managers often want to determine which particular prediction method or model is best in terms of selected performance criteria. In this regard one model may be chosen and the others discarded. Very often the discarded models contain information not included in the "best" forecast model. Bates and Granger have suggested that a composite method is preferred where forecasts given by several individual models or techniques are combined. Researchers (Bessler and Brandt), using empirical data, have demonstrated that composite forecasts are likely to outperform forecasts from individual models.

In this study, a composite forecasting approach that combines the forecasts of the individual models described above is considered: equally weighted econometric and ARIMA forecasts are combined to predict monthly change in loan volume outstanding. Equal weights are chosen because no information is available on the historical performance of each individual model.

Projections of Loan Volume by FICB

An averaging model is currently used by the FICB to forecast monthly loan volume; its predictive ability is compared to the forecast performance of the models mentioned above.

FICB Averaging Model

This model uses an historical data series of the average historical percentage change in loans outstanding for monthly data from 1973 to the current month to project monthly loans outstanding. Forecasts are generated in the following manner. A 12-month ahead forecast is made each month; that is, each month a forecast is made for end-of-month loan volume outstanding for each of the next 12 months. By multiplying the historical average percentage change in loans outstanding between the prior month and the forecast month times the prior month's loans outstanding and adding this value to the prior month's actual loans outstanding, the first-month forecast is determined. The two-to-12-month ahead forecasts are generated in a similar manner. All calculations are based on end-of-month values.

Forecast Results and Evaluation

After initially estimating and examining the statistical fit of each alternative forecasting model, forecasts for Sixth District loans outstanding are generated. Then, performance measures of each model's forecasting ability are computed and compared among forecast models. Actually, equations 1, 2 and 3 predict monthly change in loans outstanding; monthly change is added to or subtracted from the preceding month's volume of loans outstanding to yield a forecast of end-of-month loans outstanding. In total, a dozen 12-month ahead ex post forecasts are generated by each model. Therefore, the particular performance measures used here indicate how well each model predicts over a period of 23 months: January 1983 through November 1984.

The first 12-month ahead ex post forecast sequence covers the time period 8301-8312. Upon addition of new monthly data, each forecasting model is reestimated and a new, updated 12-month ahead forecast series is generated. As new monthly data are added, oldest monthly data are dropped. In this manner, the number of months a model is estimated over remains constant. Therefore, the second 12-month ahead ex post forecast sequence (8302-8401) results from models that are estimated over the 84-month period 7602-8301. Similar procedures are followed until the last 12-month forecast series (8312-8411) is made. Econometric models are respecified and the ARIMA model is reidentified each time a new forecast series is generated.[3]

Forecast results reported as percent difference between actual and forecasted values and associated summary statistics for Sixth District FICB loans outstanding are presented in tables 1-6. Actual and forecasted loan volumes outstanding are reported in tables 1A-6A (see Appendix). Loan volumes are end of month values and are expressed in nominal dollars.

MSPE comparisons among models for each 12-month ahead forecast do not give a clear picture of model performance. Therefore, to facilitate comparisons, average MSPEs are computed for all forecast models. These results indicate that the composite models perform equally well and best over the entire range of forecast intervals. The DUM model performs third best, while the ECON, ARIMA, and AVG models perform fourth, fifth, and last, respectively.

Examination of average absolute errors in tables 1-6 indicate that the Bank's AVG model is the only model that exhibits increasing forecast error over the entire 12-month ahead forecast horizon. The AVG model's projections are on average accurate to within 7.1 percent six months out and 10.5 percent a year out. Three of the five alternative models--DUM, DUM-ARIMA and ECON-ARIMA--show an average absolute error 12-months ahead that is no greater than, if not less than, the one-month ahead average absolute error. At no time do the two econometric and two composite models have an average absolute error greater than four percent.

Table 7 summarizes forecasting performance with respect to directional accuracy; that is, the ability of the forecast models to anticipate turning points and trends. A turning point (change in direction) occurs if actual loan volume increases one month, then decreases the next (a peak) or if actual loan volume decreases one month, then increases the next (a trough). Loan volume increases two consecutive months or more indicate an uptrend, while decreases two consecutive months or more signal a downtrend.

Each forecast model's turning point and trend accuracy is determined for each 12-month ahead forecast. To aid comparison among models, total correct and incorrect turn forecasts and correct and incorrect trend forecasts are computed for each model and then forecast performance is reported as total correct (correct turn and trend forecast) as a percentage of total correct plus total incorrect (correct turn and trend forecast plus incorrect turn and trend forecast).[4] Consequently, at a maximum, correct turn and trend movement can be forecast 11 times within a 12-month ahead forecast interval or 132 times over all 12 12-month ahead forecast sequences.

Examination of table 7 reveals that the AVG model predicts turning points and trends exceptionally well and substantially better than all other models. The DUM, ECON-ARIMA composite, and ECON models perform nearly equal, while the DUM-ARIMA composite and ARIMA models are the poorest predictors. These latter five models are able to correctly predict 47 to 60 percent of all turning points and trends compared to 99 percent correct prediciton for the AVG model.

Summary and Conclusions

The conclusions that follow are specific to the data used, the models examined, and the time period studied. Therefore, generalization of the conclusions to other data, models, time periods, and forecast horizons is cautioned. The purpose of the study was to compare the performance of various models for forecasting Sixth District FICB loan volume outstanding, in particular, to compare the performance of an averaging (AVG) model used by Bank personnel to forecast monthly loan volume to the predictive ability of two econometric models, an ARIMA model, and two composite models.

With respect to average MSPEs and average absolute errors, the dummy (DUM) model and both composite models (ECON-ARIMA and DUM-ARIMA) outperformed the other forecast models. Of these three, both composite models were slightly better predictors than the DUM model when comparisons were only based on average MSPEs. When individual MSPEs and average absolute errors were examined, the DUM-ARIMA composite model slightly outperformed the ECON-ARIMA model. The FICB's AVG model performed the poorest under all comparisons.

The models that showed the lowest MSPEs did not necessarily predict directional accuracy best. The AVG model substantially outperformed all other forecast models with respect to turning points and trends. Among the other models, no model clearly stood out as second best.

In conclusion, the results suggest the following recommendations. For predictive accuracy, the DUM model or either composite model would be preferred to the AVG model currently used by the Bank. The DUM and DUM-ARIMA models are preferred to the ECON-ARIMA model because the latter requires that the forecaster first forecast current exogenous variable values before predicting the dependent variable. Such a procedure is likely to increase forecast error. The DUM-ARIMA composite model and DUM model avoid this ex ante criticism since neither model contains structural variables. Consequently, the two former models are likely to outperform the latter over an ex ante time frame. The structural econometric (ECON) model's value may lie in its ability to aid Bank personnel whose task is to anticipate how changes in structural variables would affect loan volume outstanding.

The choice between the DUM model or DUM-ARIMA composite model is a moot point. The models compare favorably when their summary statistics are evaluated. Model selection may come down to the amount of resources the Bank wants to commit to generating point forecasts; the DUM model is simpler and less costly and time consuming, but the DUM-ARIMA model may hold a slight edge in forecast performance.

When turning point and trend accuracy is desired, as it might be for strategic planning purposes, model choice is clear. The AVG model is far superior to all other models evaluated. The fact that the AVG model did not show the lowest MSPEs and average absolute errors, and for that matter, exhibited the poorest summary statistics among the models evaluated, suggests that Bank personnel may want to use the DUM model or the DUM-ARIMA composite model to forecast monthly loan volume outstanding and use the AVG model to predict turning points and trends.

Further research might involve exploring several forecasting alternatives not evaluated here. One possibility is to experiment with combining forecasts made for the same month but that were generated at different times. Another alternative to explore is combining the AVG and DUM model forecasts and the AVG, DUM, and ARIMA model predictions. These composite model forecasts could then be compared to models evaluated in this study. The Sixth District FICB recently began forecasting monthly loan volume outstanding with a model that uses the average historical percentage change in loans outstanding from 1982 to the current month. When more forecasts become available from this model, one might want to compare the forecast performance of this model to the AVG model evaluated in this study which uses average historical percentages change in loans outstanding from 1973 to the current period to project monthly loans outstanding. The more current model might more adequately reflect the slow down in loan volume growth that began in mid- 1982.

A final comment: Due to the economic crisis agriculture currently is going through, and the structural changes occurring at the farm level and within the organization and operation of the Sixth District FICB in response to the farm crisis, it is plausible that the performance of the models examined in this study may be better or worse at another point in time.

NOTES

[1]An example of a combined forecast as defined by FRS is the following: Suppose a forecast made in July, 1984, predicts that loan volume will be $1.1 billion on January 1, 1985, while another forecast produced in October predicts January loan volume will be $900 million. The combined forecast for January 1, 1985, would be $1 billion.

[2]A study by Njinkeu evaluated the statistical and forecasting properties of 10 analytical models--one ARIMA and nine econometric--in order to determine which models were best with respect to predictive ability. Equations 1, 2 and 3 are drawn from his research. Model 1 (Equation 1) exhibited the lowest forecast error and had the second lowest number of turning point errors over the time period analyzed. Model 2 (Equation 2) is included here because it was the only econometric model analyzed that was capable of generating ex ante forecasts without the need to first forecast current exogenous variable values before predicting the dependent variable--an important consideration for any serious forecaster constrained by time and funds. Although it did not perform best based on forecast accuracy and ability to predict turning points, model 2 did exhibit acceptable statistical properties.

[3]Space limitations prohibit reporting the estimated updated models; the coefficient values of the econometric models differed only slightly from those reported in equations 1 and 2. A frequently used updated ARIMA model was of the form $(1 + \phi_1 B + \phi_5 B^5)(1 - B)(1 - B^{12})LVO_t = a_t$.

[4]A correct turn forecast occurs when forecasted and actual loan volume increases one month, then decreases the next or decreases one month, then increases the next. A correct trend forecast is made when forecasted and actual loan volume move in the same direction two months in a row. Each observed turn and trend in loan volume that is correctly forecast adds an increment to total correct. An incorrect turn forecast occurs when forecasted loan volume indicates a peak or trough, while actual loan volume shows no turn. An incorrect turn forecast may also occur when forecasted loan volume indicates a peak turn, while actual loan volume shows a trough, and vise versa, when forecasted loan volume indicates a trough when in fact actual loan volume peaks. An incorrect trend forecast occurs when forecasted directional movement of loan volume is opposite the actual direction of trend. Each incorrectly forecast turn and trend in loan volume adds an increment to total incorrect.

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Table 1. Summary of Statistics for Monthly Forecasts of Sixth District FICB Outstanding Non-Real Estate Loan Volume by ECON Model[a]

Time Horizon (Months Ahead)[b]	Month Forecast Begins (1983)[c] JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Average Absolute Error[e]
	--percent difference between actual and forecasted values[d]--												
1	.091	.044	.010	-.007	-.014	-.009	-.021	-.018	-.007	-.007	.073	.033	.028
2	.045	.009	-.002	-.015	-.007	-.018	-.017	-.007	.062	.064	.030	.078	.030
3	.012	-.004	-.011	-.011	-.017	-.016	-.006	.061	.073	.073	.074	.036	.033
4	-.003	-.013	-.008	-.019	-.014	-.005	.062	.073	.029	.031	.032	-.002	.024
5	-.012	-.010	-.016	-.017	-.004	.063	.073	.029	.073	.074	-.006	-.017	.033
6	-.010	-.018	-.014	-.006	.063	.072	.030	.073	.031	.031	-.021	-.018	.032
7	-.017	-.015	-.003	.061	.074	.030	.074	.030	-.007	-.007	-.023	-.046	.032
8	-.014	-.005	-.064	.071	.032	.073	.031	-.008	-.022	-.021	-.048	-.022	.034
9	-.003	.063	.075	.029	.075	.030	-.077	-.023	-.024	-.023	-.027	-.020	.039
10	-.064	.074	.033	.072	.032	-.007	-.022	-.025	-.049	-.047	-.025	-.008	.038
11	.075	.032	.076	.029	-.005	-.022	-.024	-.050	-.028	-.027	-.012	.054	.036
12	.033	.075	.033	-.008	-.021	-.022	-.049	-.028	-.026	-.025	.051	.079	.038
													Average MSPE[g]
MSPE[f]	.002	.002	.002	.001	.002	.002	.002	.002	.002	.002	.002	.002	.0020

[a]Econometric model (equation 1)

[b]The forecast time horizon indicates the number of months projected into the future from the starting date.

[c]The origination date of the forecast. For example, JAN relates to the ex post forecast sequence that begins January, 1983 and ends December 1983. In a similar manner, FEB begins February 1983 and ends January 1984, while DEC begins December 1983 and ends November 1984.

[d]The numbers in the body of the table indicate the percentage difference between actual and forecasted values for the forecast time horizon shown. Actual values are used as the base for calculating percentage differences.

[e]Average absolute errors are calculated for each time horizon by adding the absolute values of each error in the row and averaging them.

[f]Mean square percentage error

$$MSPE = \frac{1}{T} \sum_{t=1}^{T} \left[\frac{F_t - A_t}{A_t} \right]^2$$

where F = forecasted loan volume outstanding time period "t",
A = actual loan volume outstanding time period "t,"
T = number of months simulated (12)

[g]Average MSPE of the 12 forecast sequences

Table 2. Summary Statistics for Monthly Forecasts of Sixth District FICB Outstanding Non-Real Estate Loan Volume by DUM Model[a]

Time Horizon (Months Ahead)[b]	Month Forecast Begins (1983)[c] JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Average Absolute Error[e]
	--percent difference between actual and forecasted values[d]--												
1	.035	.011	-.026	-.029	-.032	-.040	-.029	.071	-.014	-.014	.073	.002	.031
2	.008	-.026	-.029	-.031	-.042	-.028	-.026	.025	.046	.049	.030	.052	.033
3	-.027	-.029	-.032	-.041	-.029	-.025	-.014	.018	.058	.003	.074	.011	.030
4	-.030	-.032	-.041	-.028	-.026	-.014	.046	.036	.003	.003	.032	-.027	.027
5	-.033	-.042	-.029	-.025	-.014	.047	.056	-.016	.053	.053	-.006	-.032	.034
6	-.042	-.029	-.025	.014	.046	.056	.003	.052	.012	.012	-.021	-.032	.029
7	-.029	-.026	-.014	.047	.056	.003	.053	.012	-.026	-.025	-.023	-.047	.030
8	-.026	-.015	.047	.056	.003	.053	.012	-.025	-.031	-.030	-.048	-.029	.031
9	-.015	.045	.055	.003	.053	.012	-.025	-.031	-.032	-.030	-.027	-.026	.030
10	.045	.052	.002	.053	.012	-.025	-.030	-.031	-.045	-.044	-.025	-.013	.031
11	.053	.003	.052	.011	-.026	-.031	-.029	-.045	-.028	-.028	-.012	.047	.030
12	-.002	.042	.010	-.026	-.031	-.030	-.041	-.027	-.025	-.025	.051	.054	.030
													Average MSPE[g]
MSPE[f]	.001	.001	.001	.001	.001	.004	.001	.001	.001	.002	.001	.001	.0013

[a]Econometric (dummy variable) model (equation 2)

[b-g]See Table 1 for explanation.

Table 3. Summary Statistics for Monthly Forecasts of Sixth District FICB Outstanding Non-Real Estate Loan Volume by ARIMA Model[a]

Time Horizon (Months Ahead)[b]	Month Forecast Begins (1983)[c]												Average Absolute Error[e]
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
	--percent difference between actual and forecasted values[d]--												
1	.025	-.008	-.074	-.067	-.012	.106	.071	.047	-.016	-.014	.073	-.006	.043
2	-.014	-.059	-.023	-.043	.003	.171	.111	.010	-.006	-.048	.030	.016	.053
3	-.064	-.047	-.067	-.025	.073	.122	.049	-.006	-.038	-.023	.074	-.059	.054
4	-.052	-.047	-.042	-.009	.090	.152	.017	.004	-.010	-.027	.032	-.012	.041
5	-.052	-.087	-.025	.041	.057	.116	-.004	-.029	-.021	-.007	-.006	-.076	.043
6	-.091	-.051	-.010	.063	.088	.070	.007	-.004	.012	-.070	-.021	-.115	.044
7	-.060	-.046	.039	.032	.049	.061	-.026	.012	.085	.133	-.023	-.125	.058
8	-.053	.033	.066	.063	-.005	.075	.002	.029	.157	.055	-.048	-.110	.058
9	-.040	.015	.032	.019	.001	-.063	.017	.104	.069	.093	-.027	-.137	.051
10	-.008	.034	.062	-.030	.015	-.028	.042	.165	.115	.031	-.025	-.113	.056
11	.026	-.014	.020	-.004	-.045	-.015	.114	.084	.044	-.005	-.012	-.119	.042
12	-.022	.021	.003	.026	-.009	.012	.172	.120	.011	-.020	.051	-.111	.048
													Average MSPE[g]
MSPE[f]	.002	.002	.002	.002	.004	.004	.005	.005	.004	.005	.009	.009	.0040

[a] Autoregressive integrated moving average model (equation 3)

[b-g] See Table 1 for explanation.

Table 4. Summary Statistics for Monthly Forecasts of Sixth District FICB Outstanding Non-Real Estate Loan Volume by Composite Model--ECON and ARIMA[a]

Time Horizon (Months Ahead)[b]	Month Forecast Begins (1983)[c] JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Average Absolute Error[e]
	--percent difference between actual and forecasted values[d]--												
1	.058	.001	-.008	-.037	-.022	.048	.025	.015	-.015	-.014	.021	-.002	.022
2	.016	-.042	-.013	-.029	-.019	.077	.047	.002	.022	.001	.008	.034	.026
3	-.026	-.038	-.039	-.017	-.021	.053	.021	.028	.011	.017	.065	-.024	.030
4	-.027	-.039	-.025	-.014	-.032	.073	.039	.038	.002	-.012	.076	-.020	.033
5	-.032	-.064	-.021	-.012	.073	.089	.035	.000	.022	.023	.018	-.054	.037
6	-.050	-.040	-.012	.029	.067	.071	.018	.034	.009	.041	.033	-.074	.040
7	-.038	-.036	.018	.046	.052	.046	.024	.004	.028	.054	-.001	-.085	.036
8	-.034	-.024	.065	.067	-.001	.074	.017	.025	.053	.013	-.033	-.069	.040
9	-.022	.030	-.014	.024	.027	.012	.005	.047	.013	.031	-.030	-.081	.028
10	.036	.046	.048	.021	.069	-.025	.010	-.046	.020	-.030	-.024	-.063	.037
11	.051	-.008	-.018	.017	.038	-.031	.045	.011	-.006	-.016	-.033	-.036	.023
12	.005	.031	.042	.009	.011	-.030	.062	.000	-.017	-.023	.010	-.028	.022
													Average MSPE[g]
MSPE[f]	.001	.001	.001	.001	.002	.001	.001	.001	.000	.001	.001	.003	.0010

[a]Composite of econometric (equation 1) and ARIMA (equation 3) models--simple average method

Z

[b-g]See Table 1 for explanation.

Table 5. Summary Statistics for Monthly Forecasts of Sixth District FICB Outstanding Non-Real Estate Loan Volume by Composite Model--DUM and ARIMA[a]

Time Horizon (Months Ahead)[b]	Month Forecast Begins (1983)[c]												Average Absolute Error[e]
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
	--percent difference between actual and forecasted values[d]--												
1	.059	.001	-.026	-.048	-.022	.032	.020	.011	-.019	-.014	.012	-.002	.022
2	.028	-.042	-.026	-.037	-.019	.072	.043	-.002	.015	.001	-.005	.034	.027
3	-.016	-.038	-.049	-.033	.022	.049	.017	.021	.002	.017	.054	-.019	.028
4	-.012	-.039	-.042	-.019	.032	.069	.032	.030	-.011	-.012	.071	-.020	.032
5	-.013	-.064	-.027	.008	.022	.081	.025	-.055	.011	.028	.008	-.054	.033
6	-.039	-.040	-.018	.025	.067	.063	.005	.024	.004	.041	.028	-.074	.036
7	-.015	-.036	.012	.039	.052	.032	.014	.016	.019	.054	-.005	-.085	.032
8	-.007	-.024	.056	.059	-.001	.064	.098	.002	.048	.013	-.032	-.069	.039
9	.004	.030	.044	.011	.027	-.021	-.010	.037	.009	.031	-.031	-.081	.028
10	.071	.043	.032	.011	-.062	-.027	.016	.067	.022	-.006	-.025	-.063	.037
11	.109	-.008	.036	.012	-.035	-.023	.005	.020	-.001	-.016	-.034	-.036	.028
12	.032	.031	-.002	.000	-.020	-.009	.021	.046	-.017	-.023	.007	-.028	.020
													Average MSPE[g]
MSPE[f]	.002	.001	.001	.001	.001	.000	.001	.001	.000	.000	.001	.003	.0010

[a]Composite of econometric (equation 2) and ARIMA (equation 3) model--simple average method

[b-g]See Table 1 for explanation.

Table 6. Summary Statistics for Monthly Forecasts of Sixth District FICB Outstanding Non-Real Estate Loan Volume by AVG Model[a]

Time Horizon (Months Ahead)[b]	Month Forecast Begins (1983)[c]												Average Absolute Error[e]
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
	--percent difference between actual and forecasted values[d]--												
1	-.060	-.036	-.035	-.012	-.024	.000	-.010	-.003	-.013	-.011	.002	.008	.018
2	-.098	-.072	-.047	-.036	-.024	-.010	-.012	-.016	-.024	-.009	.010	-.015	.031
3	-.136	-.085	-.072	-.036	-.034	-.012	-.026	-.027	-.022	.000	-.012	-.018	.040
4	-.150	-.111	-.072	-.046	-.037	-.026	-.037	-.025	-.014	-.023	-.016	-.047	.050
5	-.177	-.111	-.082	-.049	-.050	-.037	-.034	-.016	-.037	-.027	-.045	-.068	.061
6	-.177	-.121	-.085	-.063	-.062	-.034	-.026	-.040	-.040	-.057	-.066	-.081	.071
7	-.189	-.124	-.100	-.074	-.059	-.026	-.050	-.043	-.070	-.077	-.078	-.060	.079
8	-.192	-.139	-.112	-.072	-.051	-.049	-.053	-.073	-.092	-.090	-.058	-.040	.085
9	-.207	-.151	-.109	-.063	-.075	-.053	-.083	-.094	-.105	-.069	-.038	-.031	.090
10	-.220	-.149	-.100	-.087	-.078	-.083	-.105	-.107	-.084	-.049	-.029	-.042	.094
11	-.218	-.139	-.125	-.091	-.109	-.105	-.118	-.086	-.063	-.040	-.039	-.040	.098
12	-.208	-.166	-.129	-.122	-.131	-.118	-.097	-.066	-.054	-.051	-.038	-.077	.105
													Average MSPE[g]
MSPE[f]	.031	.015	.009	.005	.005	.003	.004	.004	.004	.003	.002	.003	.007

[a]Averaging model--model currently used by Sixth District FICB to forecast monthly loan volume outstanding.

[b-g]See Table 1 for explanation.

Table 7. Turning Point and Trend Errors for Evaluating Directional Accuracy of Sixth District FICB Outstanding Non-Real Estate Loan Volume Forecasts by Model Type

Turn and Trend Forecasts by Model[a]	Month Forecast Begins (1983)[b]												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL[i]
ECON[c]													
CTF[d]	0	0	0	0	0	0	0	0	0	1	0	0	1
ITF[e]	2	3	4	4	4	4	4	3	3	0	3	2	36
CDF[f]	6	6	5	5	5	5	5	6	7	10	6	7	73
IDF[g]	3	2	2	2	2	2	2	2	1	0	2	2	22
% Correct[h]													56%
DUM[c]													
CTF	1	1	0	0	0	0	0	1	0	1	0	0	4
ITF	2	2	4	4	4	4	4	3	3	0	3	2	35
CDF	6	8	5	5	5	5	5	6	7	10	6	7	75
IDF	2	0	2	2	2	2	2	1	1	0	2	2	18
% Correct													60%
ARIMA[c]													
CTF	0	0	0	0	1	0	1	1	0	0	0	0	3
ITF	4	5	2	4	6	8	1	3	1	1	3	4	42
CDF	3	3	7	4	2	1	5	5	9	9	6	6	60
IDF	4	3	2	3	2	2	4	2	1	1	2	1	27
% Correct													47%
COMPI: ECON-ARIMA[c]													
CTF	0	0	0	1	2	0	1	1	0	0	2	0	7
ITF	2	5	4	3	4	5	5	5	5	1	1	2	42
CDF	6	5	5	5	5	5	4	4	5	10	8	7	69
IDF	3	1	2	2	0	1	1	1	1	0	0	2	14
% Correct													58%
COMPII: DUM-ARIMA[c]													
CTF	1	0	0	1	1	0	1	1	0	0	2	0	7
ITF	4	5	4	3	6	5	5	5	5	1	3	2	48
CDF	4	5	5	5	2	4	4	3	5	9	6	7	59
IDF	2	1	2	2	2	2	1	2	1	1	0	2	18
% Correct													50%
AVG[c]													
CTF	1	1	1	2	2	2	2	2	1	1	2	2	19
ITF	0	0	0	0	0	0	0	0	0	0	0	0	0
CDF	9	10	10	9	9	9	9	9	10	10	9	9	112
IDF	1	0	0	0	0	0	0	0	0	0	0	0	1
% Correct													99%

[a] A turning point is defined as such: if actual loan volume increases (decreases) one month, then decreases (increases) the next, a turning point (change in direction) is observed. Loan volume increases (decreases) two consecutive months or more indicate an uptrend or a downtrend.

[b] See Table 1 for explanation.

[c] See Tables 1-6 for model definitions.

[d] Correct turn forecast. Forecast model correctly forecasts a turning point or change in direction; i.e., actual forecast loan volume increases (decreases) one month, then decreases (increases) the next.

[e] Incorrect turn forecast. Forecast model incorrectly forecast a turning point; i.e., actual loan volume increases (decreases) two months in a row, while forecast indicates a turning point or actual loan volume increases (decreases) one month, then decreases (increases) the next, while forecast indicates loan volume decreases (increases) one month, then increases (decreases) the next.

[f] Correct trend forecast. Forecast model correctly predicts direction of loan volume movement; i.e., actual and forecasted loan volume increases (decreases) two months in a row.

[g] Incorrect trend forecast. Forecast model incorrectly forecasts direction of loan volume movement; i.e., actual loan volume increases (decreases) two months in a row, while model predicts decrease (increase) in loan volume two consecutive months.

[h] Total correct (CTF + CDF) as a percentage of total correct plus total incorrect (CTF + CDF + ITF + IDF).

[i] Total indicates total number of CTF, ITF, CDF, and IDF for the 12 12-month ahead forecasts. It is found by adding the values for each individual forecast series in the row.

APPENDIX

Table 1A. Monthly Forecasts for Sixth District FICB Outstanding Non-Real Estate Loan Volume--ECON Model[a]

Time Period	Actual Value ($Million)[b]	Forecast Value ($ Million)[b] Time Period (1983)[c] JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
JAN 83	1181.5	1073.7											
FEB	1140.7	1089.6	1090.2										
MAR	1145.0	1131.7	1134.6	1133.3									
APR	1174.5	1177.7	1178.9	1177.3	1182.4								
MAY	1191.6	1205.4	1206.7	1204.9	1209.5	1207.8							
JUN	1244.5	1256.5	1257.0	1254.1	1258.3	1253.8	1255.9						
JUL	1266.8	1287.8	1289.2	1287.1	1291.3	1288.2	1289.6	1292.8					
AUG	1297.8	1316.3	1317.7	1315.6	1319.7	1316.6	1318.0	1319.9	1320.7				
SEP	1305.8	1310.3	1311.8	1309.7	1313.9	1310.8	1312.3	1313.5	1314.6	1314.4			
OCT	1239.6	1159.9	1161.9	1160.7	1164.3	1161.2	1163.0	1162.6	1163.6	1163.2	1248.2		
NOV	1190.8	1101.3	1103.1	1101.1	1105.7	1103.0	1104.5	1103.4	1104.4	1103.9	1114.2	1103.3	
DEC	1184.7	1145.8	1147.1	1145.3	1149.9	1147.3	1148.7	1149.4	1150.5	1149.9	1097.9	1148.9	1145.6
JAN 84	1108.5		1025.7	1023.7	1028.4	1025.7	1027.4	1026.1	1027.6	1027.1	1073.9	1026.1	1021.7
FEB	1101.6			1064.9	1069.3	1066.8	1068.1	1067.5	1068.4	1067.8	1020.2	1066.8	1062.3
MAR	1108.9				1117.6	1114.8	1116.2	1116.8	1117.9	1117.2	1074.9	1116.1	1111.1
APR	1127.1					1150.6	1151.8	1151.6	1152.7	1152.0	1135.3	1150.9	1145.8
MAY	1154.9						1180.4	1182.2	1183.4	1182.7	1179.0	1181.4	1175.6
JUN	1229.3							1289.6	1290.5	1289.8	1257.8	1288.9	1286.0
JUL	1286.9								1323.2	1322.5	1347.9	1321.3	1315.6
AUG	1332.5									1366.6	1368.5	1365.3	1359.6
SEP	1343.7										1377.7	1360.1	1354.6
OCT	1289.3											1223.9	1219.4
NOV	1194.2												1099.9

[a] Econometric model (equation 1)

[b] End-of-month values

[c] Origination data of forecast sequence

Table 2A. Monthly Forecasts for Sixth District FICB Outstanding Non-Real Estate Loan Volume--DUM Model[a]

Time Period	Actual Value ($Million)[b]	Forecast Value ($ Million)[b] Time Period (1983)[c] JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
JAN 83	1181.5	1140.6											
FEB	1140.7	1131.0	1127.9										
MAR	1145.0	1176.3	1174.5	1174.7									
APR	1174.5	1210.1	1209.0	1208.8	1208.2								
MAY	1191.6	1230.4	1229.9	1229.4	1229.0	1230.2							
JUN	1244.5	1296.5	1296.2	1295.7	1295.4	1296.2	1294.7						
JUL	1266.8	1303.7	1303.6	1303.0	1302.8	1303.3	1302.3	1303.6					
AUG	1297.8	1331.5	1331.6	1330.8	1330.6	1330.9	1330.2	1331.1	1205.5				
SEP	1305.8	1325.2	1325.4	1324.3	1324.1	1324.3	1323.8	1324.4	1272.6	1324.2			
OCT	1239.6	1183.6	1184.1	1181.8	1181.9	1182.0	1181.6	1182.0	1217.9	1182.0	1257.1		
NOV	1190.8	1127.6	1128.3	1125.0	1124.6	1124.5	1124.3	1124.4	1147.5	1121.6	1132.2	1103.3	
DEC	1184.7	1186.9	1187.8	1181.8	1181.3	1181.1	1180.9	1180.8	1204.2	1181.2	1118.1	1148.9	1182.9
JAN 84	1108.5		1062.1	1051.1	1050.3	1050.0	1049.8	1049.6	1050.6	1050.2	1104.9	1026.1	1051.4
FEB	1101.6			1090.3	1089.2	1088.6	1088.4	1088.0	1088.6	1088.9	1043.0	1066.8	1089.8
MAR	1108.9				1138.0	1137.2	1136.9	1136.2	1137.3	1137.6	1095.8	1116.1	1138.3
APR	1127.1					1162.0	1161.6	1160.5	1162.2	1162.6	1155.6	1150.9	1163.2
MAY	1154.9						1190.0	1188.4	1190.8	1191.4	1189.6	1181.4	1192.0
JUN	1229.3							1280.7	1284.3	1285.2	1266.5	1288.9	1286.8
JUL	1286.9								1321.7	1322.9	1343.4	1321.3	1323.7
AUG	1332.5									1365.9	1369.3	1365.3	1367.0
SEP	1343.7										1377.5	1360.1	1361.7
OCT	1289.3											1223.9	1228.3
NOV	1194.2												1130.0

[a] Econometric (dummy) model (equation 2)

[b] End-of-month values

[c] Origination data of forecast sequence

Table 3A. Monthly Forecasts for Sixth District FICB Outstanding Non-Real Estate Loan Volume--ARIMA Model[a]

Time Period	Actual Value ($Million)[b]	Forecast Value ($ Million)[b] Time Period (1983)[c] JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
JAN 83	1181.5	1152.2											
FEB	1140.7	1156.2	1150.2										
MAR	1145.0	1218.8	1212.6	1174.5									
APR	1174.5	1235.1	1229.3	1201.4	1253.7								
MAY	1191.6	1253.0	1247.1	1271.3	1243.2	1205.9							
JUN	1244.5	1358.1	1352.3	1297.0	1275.8	1240.7	1113.5						
JUL	1266.8	1342.2	1331.5	1298.4	1277.9	1174.0	1049.6	1177.3					
AUG	1297.8	1367.0	1358.1	1310.9	1245.0	1181.0	1139.3	1153.5	1237.0				
SEP	1305.8	1358.2	1348.9	1254.7	1222.9	1231.0	1107.7	1242.2	1292.2	1366.1			
OCT	1239.9	1229.9	1220.6	1157.9	1200.4	1130.5	1095.9	1218.9	1245.2	1246.9	1257.3		
NOV	1190.8	1159.4	1150.4	1152.6	1115.5	1132.8	1107.9	1195.7	1185.9	1236.1	1248.0	1103.3	
DEC	1184.7	1210.6	1200.7	1111.0	1161.8	1190.4	1112.6	1176.8	1219.5	1196.7	1211.7	1148.9	1191.6
JAN 84	1108.5		1085.7	1086.8	1141.5	1107.4	1025.9	1137.0	1113.2	1131.4	1138.3	1026.1	1090.9
FEB	1101.6			1098.7	1097.3	1085.3	1171.1	1099.2	1088.9	1088.0	1109.2	1066.8	1166.3
MAR	1108.9				1079.6	1159.2	1140.2	1090.2	1076.3	1014.3	1031.7	1116.1	1123.0
APR	1127.1					1136.7	1144.3	1079.4	1009.7	950.0	977.3	1150.9	1213.1
MAY	1154.9						1141.1	1023.4	964.0	1075.0	1091.0	1181.4	1287.6
JUN	1229.3							1017.3	1126.0	1087.4	1114.6	1288.9	1380.5
JUL	1286.9								1132.5	1230.5	1246.5	1321.3	1428.7
AUG	1332.5									1317.3	1339.2	1365.3	1514.8
SEP	1343.7										1370.5	1360.1	1495.6
OCT	1289.3											1223.9	1442.5
NOV	1194.2												1326.5

[a] Autoregressive integrated moving average model (equation 3)

[b] End-of-month values

[c] Origination data of forecast sequence

Table 4A. Monthly Forecasts for Sixth District FICB Outstanding Non-Real Estate Loan Volume--Composite Model[a]

Time	Actual Value	Forecast Value ($ Million)[b] Time Period (1983)[c]											
Period	($Million)[b]	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
JAN 83	1181.5	1112.9											
FEB	1140.7	1122.9	1139.0										
MAR	1145.0	1175.2	1193.5	1153.9									
APR	1174.5	1206.4	1219.1	1189.3	1218.0								
MAY	1191.6	1229.2	1238.5	1238.1	1226.3	1218.1							
JUN	1244.5	1307.3	1324.2	1275.6	1267.1	1268.5	1184.7						
JUL	1266.8	1315.0	1317.6	1292.8	1284.6	1238.6	1169.6	1235.0					
AUG	1297.8	1341.7	1344.8	1313.2	1282.4	1256.0	1228.7	1236.7	1278.9				
SEP	1305.8	1334.3	1337.2	1282.2	1268.4	1277.6	1210.0	1277.9	1303.4	1325.5			
OCT	1239.6	1195.0	1202.4	1158.8	1182.3	1156.3	1129.4	1190.8	1204.4	1211.9	1257.2		
NOV	1190.8	1130.4	1139.4	1126.9	1110.6	1128.7	1106.2	1149.6	1145.2	1177.6	1190.1	1166.3	
DEC	1184.7	1178.2	1194.3	1128.2	1155.9	1185.7	1130.6	1163.1	1185.0	1182.5	1164.9	1175.1	1187.2
JAN 84	1108.5		1073.9	1055.3	1085.0	1078.7	1026.6	1081.9	1070.4	1084.3	1121.6	1037.0	1071.2
FEB	1101.6			1081.8	1083.3	1025.7	1088.4	1083.3	1097.1	1091.3	1076.1	1017.9	1128.0
MAR	1108.9				1098.6	1066.8	1136.9	1103.5	1081.2	1077.3	1063.7	1089.2	1130.6
APR	1127.1					1114.8	1161.6	1115.5	1073.7	1067.6	1066.4	1089.9	1188.1
MAY	1154.9						1190.0	1102.8	1208.2	1139.7	1140.4	1155.5	1239.8
JUN	1229.3							1153.5	1227.8	1205.1	1190.6	1270.2	1333.2
JUL	1286.9								1228.0	1287.3	1295.0	1325.4	1376.2
AUG	1332.5									1355.7	1354.3	1365.1	1440.9
SEP	1343.7										1374.0	1387.5	1428.6
OCT	1289.3											1276.7	1335.4
NOV	1194.2												1227.8

[a]Composite model I - econometric (equation 1) and ARIMA (equation 3)

[b]End-of-month values

[c]Origination data of forecast sequence

Table 5A. Monthly Forecasts for Sixth District FICB Outstanding Non-Real Estate Loan Volume--Composite Model[a]

Time Period	Actual Value ($Million)[b]	Forecast Value ($ Million)[b] Time Period (1983)[c] JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
JAN 83	1181.5	1112.0											
FEB	1140.7	1109.2	1139.0										
MAR	1145.0	1163.2	1193.5	1174.6									
APR	1174.5	1188.2	1219.1	1205.1	1231.0								
MAY	1191.6	1207.4	1238.5	1250.3	1236.1	1218.1							
JUN	1244.5	1292.9	1324.2	1296.4	1285.6	1268.5	1204.1						
JUL	1266.8	1285.8	1317.6	1300.7	1290.3	1238.6	1175.9	1240.4					
AUG	1297.8	1306.8	1344.8	1320.8	1287.8	1256.0	1234.8	1242.3	1283.5				
SEP	1305.8	1300.6	1337.2	1289.5	1273.5	1277.6	1215.7	1283.3	1307.8	1330.4			
OCT	1239.6	1151.8	1202.4	1169.9	1191.2	1156.3	1138.8	1200.5	1213.3	1221.3	1257.2		
NOV	1190.8	1061.2	1139.4	1138.8	1120.1	1128.7	1116.1	1160.8	1155.1	1187.9	1190.1	1176.7	
DEC	1184.7	1146.6	1194.3	1146.4	1171.5	1185.7	1146.7	1178.8	1250.2	1198.1	1164.9	1191.1	1187.2
JAN 84	1108.5		1073.9	1069.0	1095.9	1078.7	1037.8	1093.3	1081.5	1095.8	1121.6	1048.9	1071.2
FEB	1101.6			1108.8	1093.2	1174.9	1129.7	1113.2	1088.8	1101.8	1076.1	1028.4	1128.0
MAR	1108.9				1108.8	1148.2	1138.5	1119.9	1106.8	1087.5	1063.7	1100.0	1130.6
APR	1127.1					1149.3	1152.9	1108.9	1085.9	1073.0	1066.4	1095.9	1188.1
MAY	1154.9						1165.5	1149.0	1077.4	1144.1	1140.3	1160.8	1239.8
JUN	1229.3							1203.0	1205.2	1202.4	1190.6	1268.7	1333.2
JUL	1286.9								1227.1	1287.6	1295.0	1326.9	1376.2
AUG	1332.5									1355.4	1354.3	1366.3	1440.9
SEP	1343.7										1374.0	1388.9	1428.6
OCT	1289.3											1279.8	1335.4
NOV	1194.2												1227.8

[a] Composite model II - econometric (equation 2) and ARIMA (equation 3) models

[b] End-of-month values

[c] Origination data of forecast sequence

Table 6A. Monthly Forecasts for Sixth District FICB Outstanding Non-Real Estate Loan Volume--AVG Model[a]

Time Period	Actual Value[b] ($Million)	Forecast Value ($ Million)[b] Time Period (1983)[c] JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
JAN 83	1181.5	1252.2											
FEB	1140.7	1252.4	1181.7										
MAR	1145.0	1301.0	1227.5	1184.9									
APR	1174.5	1350.2	1273.9	1229.7	1188.3								
MAY	1191.6	1402.9	1323.7	1277.8	1234.7	1220.4							
JUN	1244.5	1465.1	1382.4	1334.5	1289.5	1274.5	1244.4						
JUL	1266.8	1505.6	1420.6	1371.3	1325.1	1309.7	1278.8	1278.9					
AUG	1297.8	1546.4	1459.1	1408.5	1361.0	1345.2	1313.5	1313.5	1301.1				
SEP	1305.8	1576.7	1487.6	1436.1	1387.7	1371.6	1339.2	1339.3	1326.6	1323.2			
OCT	1239.6	1512.8	1427.3	1377.9	1331.4	1316.0	1284.9	1285.0	1272.8	1269.6	1252.9		
NOV	1190.8	1450.2	1368.3	1320.9	1276.4	1261.5	1231.8	1231.8	1220.2	1217.1	1201.0	1188.3	
DEC	1184.7	1430.7	1349.9	1303.1	1259.2	1244.6	1215.2	1215.3	1203.8	1200.7	1184.9	1172.3	1174.8
JAN 84	1108.5		1292.2	1247.5	1205.4	1191.4	1163.3	1163.4	1152.4	1149.4	1134.3	1122.3	1124.6
FEB	1101.6			1243.7	1201.8	1187.8	1159.8	1159.8	1148.9	1145.9	1130.9	1118.9	1121.2
MAR	1108.9				1244.5	1230.1	1201.1	1201.1	1189.8	1186.7	1171.9	1158.7	1161.1
APR	1127.1					1275.3	1245.2	1245.2	1233.5	1230.3	1214.1	1201.3	1203.8
MAY	1154.9						1291.1	1291.1	1278.9	1275.7	1258.9	1245.5	1248.1
JUN	1229.3							1348.4	1335.6	1332.2	1314.7	1300.8	1303.5
JUL	1286.9								1371.4	1367.8	1349.8	1335.5	1338.3
AUG	1332.5									1404.6	1386.1	1371.4	1374.3
SEP	1343.7										1411.6	1396.6	1399.5
OCT	1289.3											1338.7	1341.5
NOV	1194.2												1286.2

[a]Averaging model used by Sixth District FICB

[b]End-of-month values

[c]Origination data of forecast sequence