

STUDY METHODOLOGY AND APPENDICES REPORT



ENHANCING LIVES, IMPACTING COMMUNITIES: THE FEDERAL HOME LOAN BANK SYSTEM



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The economic impact study timeframe includes inflation-adjusted data for the affordable housing development and home-purchases enhanced by the Federal Home Loan Bank System since 1990 and 1995, respectively.

Executive Summary

This report details the national economic impacts of the rental and owner-occupied affordable housing development and the home purchases that have been enhanced, in part, by the Federal Home Loan Banks' Affordable Housing Program (AHP) from 1990 through 2016. Analysis of the local, state and regional economic impacts were conducted and presented in separate reports delineated by geography.

The Federal Home Loan Bank System (FHLBank System) was chartered by Congress in 1932. It consists of 11 individual Federal Home Loan Banks (FHLBanks), each of which covers a defined geographic region, each referred to as a district. The mission of the FHLBanks is to provide reliable liquidity to member financial institutions to support housing finance, asset-liability management, and community investment.¹

Since its creation in 1989, the FHLB System's AHP has been a substantial and valuable source of real estate equity for the financing of affordable housing in the United States. From 1990 through 2016, the 11 FHLBanks collectively contributed more than \$4.1 billion (\$5.4 billion in inflation-adjusted dollars) in AHP real estate finance equity for rental, home construction and rehabilitation projects. This equity was combined with \$65.7 billion (\$83.9 billion in inflation-adjusted dollars) in leveraged dollars from other private and public sources, enabling \$69.9 billion (\$89.3 billion in inflation-adjusted dollars) in total development funding for more than 601,000 housing units. From 1995 through 2016, the FHLBanks also collectively contributed approximately \$1.0 billion (\$1.2 billion in inflation-adjusted dollars) in AHP equity for down payment assistance and mortgage principal reduction, assisting more than 183,000 home purchases.

Each FHLBank allocates at least 10 percent of its annual net earnings to fund its AHP. As such, the continued operating and mission success of the FHLBanks has directly enhanced the development and purchase of affordable housing throughout the country and has had a positive impact on local and state economies as well as on the national economy.

In 2017, the FHLBanks contracted with the Florida State University Center for Economic Forecasting and Analysis (FSU CEFA) to conduct an Economic Impact Analysis of the AHP.

The FSU CEFA study team received, reviewed and analyzed data provided by each of the 11 FHLBanks. The data pertains to the total financing and total development cost associated with AHP-enhanced affordable housing development projects and home purchases. Data received included AHP funding dollars, other "equity-like" funding dollars, leveraging dollars, total units and the total costs associated with AHP-enhanced development projects and home purchases. The inflation-adjusted data were used as inputs to the IMPLAN economic input-output models² in order to estimate the economic impacts. Inflation-adjusted refers to the measure of return that takes into account the time period's inflation rate. IMPLAN is a widely accepted, integrated input-output model, used extensively by federal, state and local government agencies, as well as other private and non-profit entities, to measure proposed legislative and other program and policy economic impacts across sectors.

The economic impact of the affordable rental and owner-occupied housing enhanced by the FHLBanks' AHP funding is delineated in two categories: (1) Rental, Home Construction and Rehabilitation activities, and (2) Home Purchases. The economic impacts for each of the categories are distinct. The economic impact of Rental, Home Construction

¹ <http://www.fhlbanks.com/fhlbanks--mission.html>

² <http://www.implan.com/>

and Rehabilitation is based on the direct, indirect and induced impacts of development or construction-related activity. The economic impact of Home Purchases is based on the activities related to the purchase of a home.

The economic impact analyses report the following outcomes at the various geographic levels:³

- One (1) national report, including Puerto Rico, Guam, American Samoa, Northern Mariana Islands, and the U.S. Virgin Islands.
- Eleven (11) district reports, delineated by the geographic boundaries of each of the 11 FHLBanks.
- Fifty-six (56) state and territory-level reports, including each of the 50 states in the United States plus Washington, D.C., Puerto Rico, Guam, American Samoa, Northern Mariana Islands and the U.S. Virgin Islands.
- Up to 110 sub-state level reports, delineated by the geographic boundaries of a county, metropolitan statistical area (MSA), or congressional district.

The following data and impact results pertain to the Study and Methodology report and are presented based on the two categories of AHP: Rental, Home Construction and Rehabilitation activities, and Home Purchases.

The 1990-2016 cumulative economic impacts for AHP-enhanced funding for Rental, Home Construction and Rehabilitation housing activities appear in Table ES1 as total economic benefits (output, or sales/revenues), job creation (employment), labor income, gross domestic product (GDP, or value-added) and tax revenue of federal, state and local governments (all in inflation-adjusted dollars). For that period, the cumulative economic impacts included an estimated \$181.00 billion in total economic benefits, \$69.24 billion in labor income, and \$102.66 billion in GDP, more than over 1.23 million full-time and part-time jobs, and \$19.98 billion in federal, state and local taxes.

Table ES1. The Total Economic Impacts of AHP-Enhanced Funding for Rental, Home Construction and Rehabilitation Activities

FHLBanks' Funding Source Category	Total Economic Benefits	Job Creation	Labor Income	GDP	Tax Revenues	
	Total Impacts	Total Impacts	Total Impacts	Total Impacts	Federal	State and Local
Rental/Home Construction/Rehabilitation	\$181.00	1,231,721	\$69.24	\$102.66	\$13.44	\$6.54

(in inflation-adjusted billion dollars)

The 1995-2016 cumulative economic impacts for AHP-enhanced funding for Home Purchases are expressed in Table ES2. The cumulative economic impacts included an estimated \$ 36.74 billion in total economic benefits, \$8.85 billion in labor income, \$23.51 billion in GDP, more than 250,000 full-time and part-time jobs, and \$3.25 billion in federal, state and local taxes.

Table ES2. The Total Economic Impacts of AHP-Enhanced Funding for Home Purchases

FHLBanks' Funding Source Category	Total Economic Benefits	Job Creation	Labor Income	GDP	Tax Revenues	
	Total Impacts	Total Impacts	Total Impacts	Total Impacts	Federal	State and Local
Home Purchases	\$36.74	250,710	\$8.85	\$23.51	\$1.81	\$1.44

(in inflation-adjusted billion dollars)

³ The economic impact analysis results are provided in up to 178 separate hard-copy and online (pdf) reports.

The total economic benefits for Rental, Home Construction and Rehabilitation activities, and Home Purchases are estimated to be \$217.74 billion, \$78.09 billion in labor income, \$126.17 billion in GDP, 1.48 million full-time and part-time jobs, and \$23.24 billion in federal, state and local taxes.

FSU also calculated the leveraging and multiplier effects of AHP-enhanced financing for the development and home purchases. The leveraging effect is the input or direct spending and includes AHP funding and other public, private and owner resources identified as used in leveraging programs. The multiplier effect is the term used for the economic ripple effect measured by an economic impact model. The multipliers provide estimates of the number of times each dollar of input, or direct spending, cycles through the economy in terms of indirect and induced output, or additional spending, personal income and employment. In this case, the multiplier effect accounts for how each additional job or dollar of output is enhanced by AHP funding.⁴ The multiplier effects for the two categories are depicted in tables ES3 and ES4. The tables show that that for every dollar of AHP-enhanced funding, there is a multiplier effect of \$33.68 in Rental, Home Construction and Rehabilitation, and a multiplier effect of \$30.04 in Home Purchases.

Table ES3. The Leveraging and Multiplier Effects of AHP-Enhanced Funding

FHLBanks' Funding Source Category	Leveraging Effect	IMPLAN Factor	Multiplier Effect
Rental, Home Construction and Rehabilitation	\$15.60	2.0284	\$33.68

Table ES4. The Leveraging and Multiplier Effects of AHP-Enhanced Funding

FHLBanks' Funding Source Category	Leveraging Effect	IMPLAN Factor	Multiplier Effect
Home Purchases	\$14.21	1.9730	\$30.01

The purpose of this Study Methodology and Appendices Report is to provide additional technical information and detail relating to the data obtained from the FHLBanks, and the FSU CEFA research team's methodology concerning the data verification and analysis process.

⁴ The multiplier effects are based on the calculation: leveraging effects multiplied by the estimated multiplier (or IMPLAN factor).

Study Methodology

The FSU CEFA research team received, reviewed, cleaned and analyzed data on AHP-enhanced funding and total development costs of AHP-enhanced rental and owner-occupied housing, provided by each FHLBank. As mentioned previously, for the purpose of the economic impact analysis, AHP-enhanced funding activity was categorized as Rental, Home Construction and Rehabilitation activities, and Home Purchases. Using IMPLAN, the research team modeled the effects of the AHP-enhanced rental and owner-occupied housing on economic benefits, job creation, labor income, gross domestic product and tax revenues.

The FHLBanks' data were provided to the FSU CEFA research team via the Federal Home Loan Bank of Atlanta (FHLB Atlanta) during the time period from July 2017 to March 2018. In the Appendix, the research team included a synopsis of relevant notes associated with the data provided by each of the FHLBanks.

Data Collection

Most data arrived in July and August 2017. There were updates to the data that were sent by the FHLBanks in October, and final updates to the data were made in February and March 2018. Data was received in Microsoft Excel format in separate FHLBank files with two subsets each: Competitive and Set-Aside funding sources. In the Appendix, the research team has included a synopsis of relevant notes associated with the data provided by each of the FHLBanks. The notes refer to things such as data limitations (varying program start dates as included), not administering specific programs, and some missing data (especially on historic records and scattered sites). A more systematic issue occurred with the Federal Home Loan Bank of Dallas, where almost all AHP Set-Aside data points for the years 2002, 2004 and 2005 were missing. As a consequence, those years were not included in the analyses.⁵

The files were then combined into two baseline database sets. Table 1 summarizes the individual project counts per FHLBank at a district level.

Table 1. Total Individual Project Count of Data Received per FHLBank District

District Name	Competitive Project Count	Set-Aside Project Count
CHI	10,778	29,492
ATL	1,731	25,723
CIN	1,945	25,345
DES	2,237	22,025
NY	1,492	12,229
PIT	1,139	11,633
IND	1,044	11,135
TOP	936	10,020
SAN	2,162	5,699
DAL	1,427	4,988
BOS	1,061	2,899
Total	25,952	161,188

⁵ See Appendix A

Competitive data reflects the time frame 1990 through 2016 for all FHLBanks. The Set-aside data reflects the years of program as available shown in Table 2.

Table 2. Set-aside Program Years reflected in the Data and Analyses.

District	"Set-Aside"
Name	Project Years
CHI	1997 - 2016
ATL	1999 - 2016
CIN	1998 - 2016
DES	1995 - 2016
NY	1997 - 2016
PIT	1996 – 2009 and 2013 - 2016
IND	2005 - 2016
TOP	1997 - 2016
SAN	2003 - 2016
BOS	2003 - 2016

Data Validation Process

The majority of the year variables were provided by the FHLBanks, while in case of missing year variables the years were by and large derived from the project codes. Some year variables, however, needed to be estimated based on the range of the project number codes. The relevant data used by the research team, for example Proposed Development Cost (PrpsdDevCost), Purchase or Contract Sale Price (CntrctSalePrice) and AHP-enhanced funding were adjusted over time to inflation-adjusted dollars based on the Consumer Price Indices (CPI) from the Bureau of Labor Statistics (BLS).⁶ The descriptive variables, especially counties, were standardized for consistency in naming conventions. Data corrections, as encountered, were made to the best of the research team’s ability. The data corrections mainly involved alignment of zip codes, street addresses, towns and/or counties (e.g. Tallahassee in Tallahassee County was corrected to Tallahassee in Leon County). Another issue concerned missing county entries (e.g., N/A). Given that the analyses were based on a common denominator (or counties), data for counties were integral to the analyses. The research team utilized zip code software⁷ as well as a variety of web-pages (zip finder/address finder) in order to locate pertinent zip-codes and/or addresses where available, and translated these to county names, where possible.^{8,9} Significantly more than 62,000 counties were updated accordingly and added to the database(s). Some county-level data, however, remained undetectable/untraceable and were marked with N/A. Only about 17.6 percent of the remaining N/As were potentially associated with “scattered site” projects (as a

⁶ BLS data retrieved from <https://www.bls.gov/bls/newsrels.htm#OPLC>

⁷ The research team used Zip Code Download software. See: https://www.zip-codes.com/zip-code-database.asp?gclid=CjwKCAjwwPfVBRBiEi-wAdkM0HXQO52_v3s2Oa8Qj3Z796vLNLfKCBRSxEeWvjwEZJ59WVXPDGoIm-RoCP6gQAvD_BwE

⁸ For districts 3 and 7, all counties had to be searched for in both the competitive and set-aside databases. District 10 lacked about 90 percent of county-level data in the competitive database, and district 11 was rather incomplete as well. The aforementioned districts did have pending special reporting requests at both county and Congressional District levels.

⁹ Both addresses and available zip codes were used to identify counties. However, many addresses were nonexistent or untraceable and did not match available zip codes. Numerous zip codes did not match addresses or were outside the cities indicated. Entries on county level were often erroneous, with many misspellings. Once found, it was observed that many zip code issues were related to numbers being interchanged. Even, at times, address and counties did not align or didn’t match the associated state code. The research team spent more than four weeks to further clean and verify the data. In the future, the research team strongly advises the Districts to more rigorously check their respective District databases prior to data submission for further analyses.

potential reason for missing location information), whereas the remainder of N/As remained unknown. Some 833 county fields, on the total project count of 25,952 with the Competitive database, remained N/A (or 3.2 percent), and 3,479 county fields on the total project count of 161,188 with the Set-Aside database remained N/A (or 2.2 percent). In aggregate, the overall or combined databases margin of error on missing counties (or N/As) is approximately 2.3 percent. At the state level or the State variable, 761 fields were filled with N/As due to lacking information to ascertain a state. The necessary economic input data of the N/As, for the impact analyses, were included in the National and districts reports at the State or district where they accrued. At the State level, an N/A county category was included within that State (but is not reported). Where the state variable lacked sufficient information, an N/A State was created (but not reported). Hence, in all cases, the data on N/As are included in the economic impact analyses.¹⁰ As the N/As are most likely not equally distributed over the various geographic entities (districts or States) of analyses, there remains a small measure of structural bias.¹¹

Table 3 shows the project count of NAs at the state and county levels.

Table 3. Total Project Count N/As at State and County Levels per District

District	Competitive		Set-Aside	
	N/A State	N/A County	N/A State	N/A County
CHI	-	662	-	2,715
DES	-	62	749	762
SAN	3	35	-	-
TOP	-	32	-	-
NY	-	20	-	-
PIT	8	8	1	2
ATL	-	7	-	-
IND	-	6	-	-
DAL	-	1	-	-
BOS	-	-	-	-
CIN	-	-	-	-
Total	11	833	750	3,479

¹⁰ As N/A rows or projects are allocated to the FHLB Districts, no data were lost at the district level of analyses.

¹¹ An additional note: one district mentioned that the submitted data was filtered for “active” records. The research team assumed that data selection prior to submission was standardized, or filtered for “all active,” across all the FHLBanks. The designation of “active,” however, was subject to discussion but was deemed outside the scope of work.

Converting Competitive and Set-aside Data into Rental, Home Construction and Rehabilitation, and Home Purchase Categories

FHLBanks offer AHP funding through two primary channels: a mandatory competitive application program, and a voluntary set-aside program. Through the former, FHLBanks provide grants to their members on behalf of project sponsors. Through the latter, FHLBanks disburse AHP funding to members to provide assistance directly to homebuyers or homeowners.

The initial data structure (i.e., set-aside and competitive) was not conducive for the economic impact analysis, as it is based on the regulatory and programmatic mechanisms defining the delivery of AHP-enhancing funding rather than the type of housing activity (e.g., construction, home purchases). As such, the research team devised a method to convert the set-aside and competitive data into the Rental, Home Construction and Rehabilitation, and Home Purchases categories. The conversion involved reallocating and realigning the program codes in the competitive and set-aside databases. This was done according to the crosswalk presented in Table 4.

An additional Allocation column was added in the following competitive database for the purpose of translating the competitive variables to allocation datasets.

Table 4. Database and Variable Designation Crosswalk

Data Base	Variables	Allocation	Combination:
Set-Aside	Purchase	Purchase	Purchase
Set-Aside	Rehab	Rehab	Rehab
Competitive	Own	C	Construction
		R	Rehab
		A	Purchase
		C/R	Rehab
		C/A	Construction
		R/A	Rehab
		C/R/A	Rehab
		Rental	Rental

*Differences in color represent a transformed variable subset

Finally, the transformed data were cumulated over the reported years. This cumulation poses some methodological issue as different year cohorts are typically modeled with a static input-output model for each year, as there are economic structural changes associated with each vintage year model. In addition, the spatial and temporal project distribution results in different economic impacts when compared to the economic impacts based on an input in aggregate or over the years. When modeling over years, the usual economic modeling approach is to examine annual expenses relative to each individual year's economic model. When using IMPLAN, the typical economic modeling approach is to examine the economic impacts associated with one year, or point in time.¹²

¹² The research team strongly advises the FHLBanks to conduct recurrent annual economic impact analyses.

Definitions of Key Terms Used in the Economic Basis and Economic Impact Analysis Sections

The following economic basis section represents the input data used for the economic modeling process. The economic impact section provides a description of the variables used in the economic impact analyses.

Economic Basis Definitions

AHP provides real estate finance equity for both rental and for-sale housing. AHP is more often referred to as a subsidy or grant and is delivered to FHLBank-member financial institutions to assist in the funding for construction, rehabilitation and purchase of affordable housing.

Development costs refers to the cost of acquiring land or pre-existing housing units, demolition and/or relocation costs, and any costs incurred while constructing, rehabilitating or redeveloping housing.

First Mortgages refers to the volume and value of first-lien position mortgages financed by lenders in a home-purchase activity.

Inflation-Adjusted refers to the measure of return that takes into account the time period's inflation rate. For example, \$100 in 1990 is worth \$192 in 2018. This study reports all economic impacts in inflation-adjusted dollars.

Projects refers to the distinct use of AHP funding for a specific acquisition, construction or rehabilitation of building(s) or housing unit(s).

Total Units refers to the total number of single-family and multifamily units constructed using AHP funding, where each individual dwelling unit in a multifamily building is counted separately.

Economic Impact Definitions

Gross Domestic Product (GDP) is also known as value added. It includes labor income (described above), other property income and tax on production and imports.

Job Creation includes new full-time, part-time, temporary, permanent, salary-based and fee-based jobs generated by AHP-enhanced Rental, Home Construction and Rehabilitation, and Home Purchases. The production of housing positively impacts employment levels within the construction industry, which involves job titles such as carpenters, electricians, plumbers, construction workers and other individuals who aid in the development or rehabilitation of homes or rental properties.

Labor Income refers to all forms of income that stem from employment, such as salaries and hourly wages, and profits made by developers, builders and contractors. It includes regular earnings, stock options, bonus payments and special payments associated with labor performed based on housing enhanced by AHP. AHP-enhanced housing has a positive impact on labor income, which in turn boosts local economies where AHP housing take place.

Multiplier is the term used for the "economic ripple" effect measured by an economic impact model. These multipliers provide estimates of the number of times each dollar of input, or direct spending, cycles through the economy in terms of indirect and induced economic outputs, or additional spending, personal income and employment. In this case, the multiplier effect accounts for how each additional job or dollar of economic benefit or output, enhanced by AHP funding impacts the construction, rehabilitation and purchases of affordable rental and housing units.

Tax Revenue includes the revenue generated by local, state and federal taxes related to Rental, Home Construction and Rehabilitation, and Home Purchases. Some forms of taxes included in this total are sales taxes on materials purchased for completion of housing units and projects enhanced by AHP funding, income taxes on workers who participated in these projects and taxes on profits that were made by businesses.

Total Economic Benefits measure the economic activities associated with Rental, Home Construction and Rehabilitation, and Home Purchases, enhanced by AHP funding. These benefits include the total sales or revenues within all industries impacted by the housing activity and essentially measure the total output that resulted from AHP-enhanced housing projects. Both Home Purchases and the total Rental, Home Construction and Rehabilitation housing activities are taken into account when calculating the total economic benefits.

Economic Model Development/Generation—IMPLAN

After the databases were prepared and determined to be ready for analysis, the research team commenced the economic impact modeling process using IMPLAN (2016).

IMPLAN is a widely accepted integrated input-output model used extensively by federal, state and local government agencies, and other private and non-profit entities, to measure proposed legislative and other program and policy economic impacts across the private and public sectors.

There are several advantages to using IMPLAN:

- It is calibrated to local conditions using a relatively large amount of local zip-code, congressional district, county-level and state-specific data;
- It is based on a strong theoretical foundation and;
- It uses a well-researched and accepted applied economics impact assessment methodology supported by many years of use across all regions of the U.S.

The economic impact model(s) used for this analysis were specifically developed for the entire nation, including Washington, D.C. and the five U.S. territories. It includes 536 business sectors (based on the North American Industrial Classification System or NAICS) and latest dataset available – year 2016 data.¹³ IMPLAN's principal advantage is that it may be used to estimate direct, indirect and induced economic impacts for any static (point in time) economic stimulus. Direct impacts measure the immediate effects as a result of AHP-enhanced funding programs in the particular area (district, state, county, sub-state), for example, in employment and income. Indirect impacts are those that include changes to production, employment, income, etc. that occur as a result of the direct effects. Induced impacts are those further impacts of spending derived from direct and indirect activities —e.g., household purchases of consumer goods and services. Economic multipliers for each business sector and household income category are used to estimate the following economic impacts: economic benefits (or output or sales/revenues), employment or job creation (full-time and part-time jobs), labor-income and GDP (or value added), among other economic impacts.

Approximately 2,750 county-specific models were developed and run in order to obtain direct, indirect, induced and total impact multipliers, and results for economic benefits (or output), employment (or job creation), labor income and GDP (or value added). In addition, another 220 IMPLAN models were generated in order to obtain federal taxes on the one hand, and local and state taxes on the other. Individual economic impact models were generated for

¹³ Year 2016 data were released at the end of November 2017.

each AHP-enhanced funding category: Rental, Home Construction and Rehabilitation, and Home Purchases. The modeling number increased exponentially when the economic analysis focused on sub-state area(s), consisting of Metropolitan Statistical Areas (MSAs), counties and/or congressional districts. There were roughly 10 sub-state areas associated with each of the 11 FHLBank districts.

Economic Model Results Database and File Management

The aggregate results of the economic impact analyses results were stored in separate files. Separate economic impact result groupings were categorized by the national, districts, states and sub-state areas. The economic impact results were further combined into the categories: Rental, Home Construction and Rehabilitation, and Home Purchases

The research team compiled and provided summary data and economic impact results files to the FSU Web Applications Group (FSU WAG) research design team. The research design team used the summary data to create, develop and generate the required deliverables of 178 hard-copy and online reports.¹⁴ The final 178 economic impact reports will be located on the Florida State University Research Computing Center (FSU RCC) server for five years, accessible via a website feature, both for report downloads and for customizable requests for counties (not included in the 178 reports).

¹⁴ The template report design and development was performed by the Florida State University Web Applications Group (FSU WAG); see: <https://nationalmaglab.org/>.

Appendix A

NOTES:

District 1 Boston.

District 2 New York:

- Set-aside began in 1996, effective 1997
- No separate Rehab set-aside.

District 3 Pittsburgh:

- The set-aside program was not given fund allocation from 2009 through 2012.

District 4 Atlanta.

District 5 Cincinnati.

District 6 Indianapolis:

- Some data missing owing to lack of TDC for competitive properties awarded prior to 2001 (with no paper files for properties out of retention).

District 7 Chicago:

- For years prior to 2000 there may be blanks for sub-state/congressional reports.
- For years 2000 and beyond there are blanks due to scattered sites.

District 8 Des Moines:

- FHLB Des Moines merged with FHLB Seattle on July 31, 2014.

District 9 Dallas:

- Years 2002, 2004 and 2005 are missing almost all data points; hence, the years mentioned were not included.
- In addition, in year 2003 no set-aside program was run.

District 10 Topeka:

- The submitted data table was filtered for active records.