EPiC Series in Built Environment
Volume 6, 2025, Pages 540–551
Proceedings of Associated Schools of Construction 61st Annual International Conference

Trends and Characteristics of Building Permits in California

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This paper is centered on the comprehensive analysis of data obtained from the Construction Industry Research Board (CIRB) of the California Homebuilding Foundation (CHF) regarding the characteristics of building permits in California. The primary objective is to establish connections between these permit characteristics and the current economic landscape. To bolster the academic rigor of this research, an academic portal is developed to provide a centralized platform for scholarly resources. The analysis includes the examination of geographical areas concerning building permits and economic indices such as population dynamics, fluctuations in interest and mortgage rates, overall inflation, home sales volume, and unemployment percentage. Educational version of Tableau software developed by Salesforce Inc. is utilized for mapping building permits for the 58 counties in California as well as for conducting time series analysis for building permits and forecasting the number of building permits across California. It was found that there is a correlation between BPs and overall inflation, mortgage rates, home sales volume and unemployment rate and there is a significant causal relationship between BPs and each of overall inflation and mortgage rates as well as a marginally significant causal relationship between BPs and each of home sales volume and unemployment rate.

Keywords: Building Permits, Economic Indices, Mapping, Time Series Analysis.

Introduction

The issuance of construction permits is a critical indicator of economic activity and urban development within a region. In California, the dynamics of construction permit sales have shown significant variation across different counties, influenced by various factors, including economic conditions, land use regulations, housing demand, and policy interventions. Understanding these factors is essential for predicting future construction trends and informing policy decisions that balance development needs with environmental and community concerns. The goal behind this study is to identify the key determinants of construction permit trends by analyzing historical data and applying quantitative analysis methods. The insights gained from this analysis, which uncover patterns and correlations that explain fluctuations in permit issuance, are valuable for policymakers and stakeholders in the construction industry, guiding their decisions and strategies. This research draws on a comprehensive set of data sources, including county-level permit data, economic indicators, and existing literature on land use and housing markets. Previous studies have underscored the role of land use regulations, economic cycles, and housing market conditions in shaping construction permit activity. For instance, restrictive land use regulations have been found to limit residential development, implementation of additional regulations was found to reduce residential permits by an average of 4% (Jackson, 2016), while economic downturns typically lead to a decline in permit issuance (Strauss, 2013). Conversely, periods of economic growth and policy incentives aimed at increasing housing supply have been associated with higher levels of construction activity (Glaeser and Gyourko, 2018). The following sections shall describe the methodology used to analyze the data, present the study's findings, and discuss their implications for future construction trends in California. By understanding the factors that drive changes in construction permits, this research contributes to the broader discourse on sustainable urban development and the challenges of managing growth in one of the most economically dynamic states in the U.S.

Literature Review

Over ninety years ago, Cover (1932) considered building permits as an important instrument for measuring residential building activity. Cover added that the significance of building permits depends not only on number and valuation of permits, and different types of building permits, but also upon efficiency of local permit officers and modifications in the process of analysis. Cover (1932) concluded that the number of building permits and its valuation is considered one of the best general indices for building activity. Many studies investigated the relationship between the number of building permits and various economic indices to develop a better understanding of market dynamics. Kishor et al. (2022) utilized a panel vector autoregression (VAR) model and found a relationship between unemployment rate and building permits (BPs) at the state level. Other studies concluded that employment rates are indicative of housing values (Case & Mayer, 1996), (Rapach & Strauss, 2007), (Irandoust, 2019). Ashuri et al. (2012) found that number of BPs is beneficial in forecasting construction costs. The composition of housing stock - which is the total number of houses, apartments in a specific area - is correlated to the number of permits (McDonald & McMillen, 2000) as well as demographics (Misago, 2008). Hwang and Quigley (Hwang & Quigley, 2006) developed a linear regression model utilizing BPs data, and increases in real housing values from 74 metropolitan areas. However, this study did not relate the number of BPs at present to housing values in the future. Gude (2023) studied the relationship between BPs and housing values. However, the scope of this study was focusing on the state of Texas, and it did not describe how BPs and housing value index (HVI) are correlated. Gude (2023) utilized multiple regression models and machine learning algorithms to predict average house prices, monthly housing inventory and total sales volume for housing. Gude (2023) also predicted different housing market characteristics by utilizing construction and socioeconomic data, such as building permits, population, unemployment rates, total income, house price index (HPI) and consumer price index (CPI). Developed forecasting model can be applicable for prediction of volatile prices for homes using simple regression models while many changes are affecting real estate such as COVID-19 pandemic and other economic changes. This can help regulators in simulating the effects of changing interest rates, zoning regulations, or tax incentives on prices of homes for better formulation of policies that foster sustainability and affordability. Zhang and Yang (2023) linked BPs and the housing value index (HVI) which is an index reflecting the home values and market changes for any region and home type. This study concluded that HVI is decreasing when BPs are increasing within 4-7 months, but it would increase if BPs are increasing within 10-12 months. Also, it was concluded that state specific HVIs are connected to national HVIs statistically. Bahaman-Oskooee et al. (2024) investigated the fluctuation in monetary supply and assessed its effect on building permits at the state-level in the USA. For example, if money supply is high, this would lead to better conditions for housing demand, and if housing supply is matching the increasing demand, this will lead to an increase in building permits. Bahaman-Oskooee et al. (2024) also considered key factors for housing market changes which are the personal household income and mortgage interest rate. It was concluded that higher household income leads to higher demand for housing because housing supply would increase to meet the demand increase.

Moreover, when mortgage rates are increasing then cost of home ownership would also increase, and this would lead to decrease in housing demand and building permits would follow the same trend. In most states, it was found that contractionary (tight) monetary policy has more effect on building permits compared to expansionary policy. Zhang and Yang (2024) investigated the relationships between the home value index (HVI) and three indices -which are the national unemployment rate, the housing consumer price index (HCPI), and the private residential construction spending (PRCS) - to review their forecasting characteristics before and after COVID-19. It was found that unemployment is considered a common indicator for housing values specifically due to the COVID-19 pandemic. PRCS indicator showed a strong relationship with housing values even during the COVID-19 disease. The HCPI indicator proved that it is a significant indicator for housing values even if it is compared with the consumer price index (CPI) which includes a group of indices that measure price fluctuations for goods and services for households' purchases. Zhang and Yang (2024) also confirmed that overall inflation is an important indicator for housing prices and that the CPI for housing is a significant indicator for housing prices. However, the structure of CPI for households was changed during the COVID-19 pandemic since recreation and travel expenses were affected during that time, while costs for housing increased during and after the pandemic. It was concluded that a comparison between housing values and both of the CPI and HCPI separately would help in identifying which index would be the best inflation indicator relevant to housing studies. Misago (2008) indicated that the most important variables affecting the number of building permits include percentage of population attributed to net migration, vacancy rate percentage for housing, percentage of population employed in health care and social assistance, and percentage of elderly population.

Research Goal and Methodology

The Data utilized in this research is collected by CIRB from all counties in California. However, CIRB reported that some counties do not have a structured policy to submit data to other organizations, and it would be helpful to endorse such a policy in all counties to enhance data collection process. Data was input by CIRB analysts into the developed academic portal as shown in Figure 1, then it was extracted by the research team in California State University, Sacramento as excel sheets from the developed academic portal. Excel sheets were imported into Tableau software for mapping, time series analysis & forecasting applications. Developed academic portal will serve as a centralized hub for accessing comprehensive data, research methodologies, and insights derived from this research project, fostering collaboration and informed decision-making in various regions of California. It would also help in improving digitalization and improvement for analysis and awareness of the building permit systems which is suggested by Fauth et al. (2023).

Data Analysis

The data provided by the CIRB is categorized into 31 unique building codes as shown in Table 1. These categories were analyzed independently using Tableau to map the data by number of permits per county and total valuation of the permits per county. Three graphs were chosen for comparison as shown in Figures 2,3&4 since it would lead to clear conclusions as described below. Additionally, the number of residential permits and the valuation of those permits per county were compared to the GDP, population, and size by square mileage of each county. Finally, the CIRB data was compared to other economic indicators using time series analysis from January 2020 until December 2022 during the period of COVID-19.

Mapping

The map created for the building code U101 as shown in Figure 2, revealed that Riverside County had the largest number of permits as well as the highest valuation in California. Riverside was followed by Sacramento in number of permits and Los Angeles (LA) in total valuation. Overall Southern California had more permits than Northern California and it was clear that inland counties had more permits for single family residential buildings compared to coastal counties and this can be attributed to the availability of land and lower construction costs for inland counties.

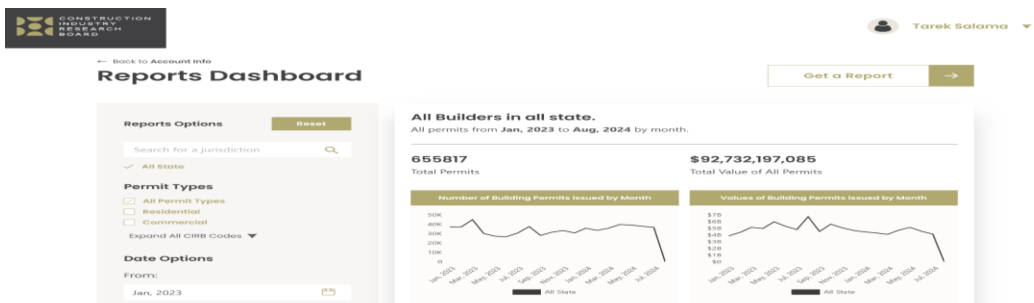

Figure 1. Developed academic portal by CIRB.

The next four building codes U102-U105 when mapped showed that LA had the largest number of permits in each of these categories. San Diego follows with the second most permits in categories U102, U104, and U105 with San Bernardino having the second most permits in U103. The next building code reviewed was U213 as shown in Figure 3. The county with the highest number of building permits was San Bernardino but it was LA that had the highest valuation for the category. The counties around LA showed a significant number of permits in this category as well. It was counties along the coast that showed the most development in this area and this can be attributed to the need for hotels/motels in coastal touristic cities more than inland cities. For Category U214, the majority of counties did not have a single permit registered. Furthermore, the counties with the highest number of permits were not in Southern California. Sacramento followed by Plumas, Mendocino, and San Juaquin counties had the largest number of permits. Category U318 showed a majority of the permits were in Southern California with the highest number in Riverside followed by San Diego. Sacramento stands out in this category as the third highest. Not all counties have permits for this category but the majority of counties along the coast have 1-3 permits. When mapped category U319 showed the majority of permits were located in the Bay Area and Southern California with Butte county being the only county in Northern California with any permits for this category. The county with the highest number of permits was Alameda with LA, Merced, and Butte tied for second. Category U320 indicated that the vast majority of industrial permits were pulled in Southern California, specifically, Riverside, Kern, and LA. There were Some counties in the Central Valley and Bay Area with permits but most counties did not have any at all. The map for U321 illustrated that Alameda, Santa Clara, LA, and Orange county had the highest number of permits. The Bay Area had the most permits at 45 but Southern California was very close with 40 permits. There were very few permits pulled for category U322 with only 33 permits in California. The majority of those permits were in Southern California with Kern having the most of all the counties. 7 out of 10 counties in SC had at least 1 permit with other significant areas being the central valley and Bay Area. One of the categories with the smallest number of permits was U323 with only 27 across California. The county with the highest number of permits was Orange County which had double the number of permits as the next highest LA. Northern California has no permits for this category, with no counties farther north than Marin with any permits. Category U324 had a total of 271 permits across 31 counties in California. The county with the highest number of permits was San Mateo followed by LA and Orange County. The regions of CA that have permits in this category were Southern CA, the Bay Area, and the Central Valley, with a few counties in Northern CA having some as well. Category U325 as shown in Figure 4 has a total number of 251 permits across 38 counties with the highest number of permits in LA followed by Contra Costa, Sacramento, Orange County, Kern, and Riverside. Surprisingly the county with the highest valuation is San Bernardino with only 6 permits but $295.8 million in valuation more than 3 times higher than the next highest of $77.8 million from Kern County. Except of LA and its suburbs, these counties are all inland counties and this would indicate that inland counties are still in need for more development compared to the well-established coastal counties regarding utilities.

Table 1. CIRB Building Code Categories

U101	Single Family Residential	U327	Stores, Malls, and other Mercantile Buildings
U102	Accessory Dwelling Units (ADU)	U328	Other Non-residential Building
U103	2 Unit Residential	U329	Structures Other than Buildings
U104	3 to 4 Unit Residential	U340C	Solar Non-Residential Installations
U105	5+ Unit Residential	U340 NR	Solar New Residential Structure
U213	Hotel/Motel	U340R	Solar Residential Installations
U214	Other Non-Housekeeping Shelter	U434	Residential alterations / additions
U318	Amusement Parks/ Recreational Facilities	U434 HVAC	Residential HVAC
U319	Religious Buildings	U437	Non-Residential Alterations & Additions
U320	Industrial Buildings	U437 HVAC	Commercial HVAC
U321	Commercial Parking Garages	U438	Both new and alterations of residential garages
U322	Gas/ Service Station	U500 C	HVAC Non-Residential Changeouts
U323	Medical Facilities	U500 R	HVAC Residential Changeouts
U324	Office Buildings	U501	Mechanical General
U325	Utilities	U502	Electric Vehicle Chargers and Stations
U326	Private Schools, Libraries, Museums		

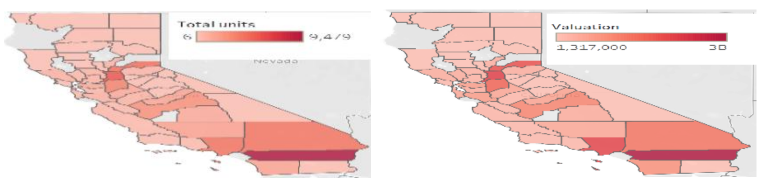

Figure 2. Map of building code U101, number of permits (left) and valuation (right).

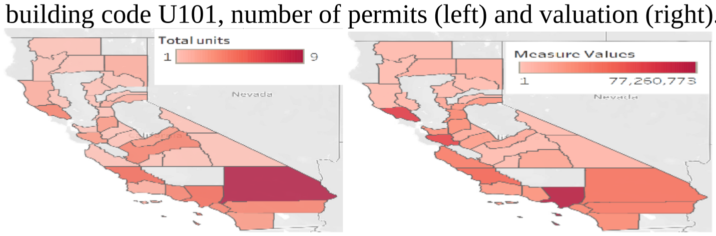

Figure 3. Map of building code U213, number of permits (left) and valuation (right).

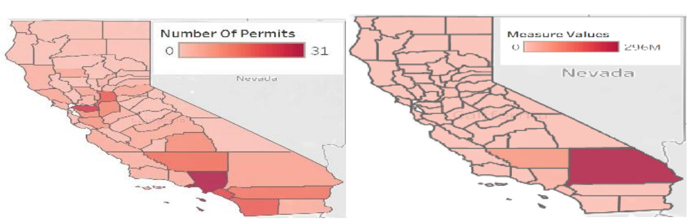

Figure 4. Map of building code U325, number of permits (left) and valuation (right).

GDP, Population, and Size Analysis

To find trends in the residential permits, total number of permits per county were compared as well as their valuation to the Gross domestic product for each county (GDP), population and total land area in square miles. The counties with the highest ratio of permits to population (highest ratio by relative comparison after dividing number of BPs/population for each county) were Mono (0.05), Placer (0.027), Butte (0.027), San Benito (0.02), Madera (0.018), Alpine (0.015), Yolo (0.015), Yuba (0.014), San Francisco (0.013), and Sonoma (0.013). The counties with the highest ratio of permits to square miles (highest ratio by relative comparison after dividing number of BPs/area of land for each county) were San Francisco (643), Orange (65), Sacramento (54), Alameda (50), Los Angeles (44), Santa Clara (34), Contra Costa (33), San Mateo (28), Placer (20), and San Joaquin (19). The Counties with the highest ratio of permits to GDP (highest ratio by relative comparison after dividing number of BPs/ GDP for each county) were Mono (0.0007), Butte (0.0006), San Benito (0.00059), Madera (0.0004), Placer (0.0004), Merced (0.0004), Yuba (0.0003), Calaveras (0.0003), Tulare (0.0003), and San Joaquin (0.0003). The counties with the highest valuation to population ratio (highest ratio by relative comparison after dividing valuation of BPs/ population for each county) were Amador (12593), San Francisco (12171), Alpine (12027), Placer (10625), San Mateo (9967), San Joaquin (8923), Napa (8800), Nevada (8680), San Benito (7389), and Mono (7327). The counties with the highest ratio of valuation to square miles (highest ratio by relative comparison after dividing valuation of BPs/ area of land for each county) were San Francisco (561276486٫4), San Mateo (42838325٫5), Orange (39963365٫2), Alameda (28383652٫8), Santa Clara (23923055٫83), Sacramento (21723351٫2), Los Angeles (17761990٫3), Contra Costa (15670883٫18), San Joaquin (13090168٫46), and San Diego (8893134٫2). The counties with the highest ratio of valuation to GDP (highest ratio by relative comparison after dividing valuation of BPs/ GDP for each county) were Amador (326٫5), Caleveras (234٫9), San Benito (217٫5), San Jaoquin (217٫5), Nevada (201٫5), Trinity (176.9), Placer (171.9), Madera (169.4), El Dorado (159.1), and Butte (143.9).

Time Series Analysis

For validating CIRB data, California residential building permits data from 1960 until 2023 was collected from the U.S. Census Bureau website, then both sources of data were compared from 2020 until 2023 as shown in Figure 5 where blue curve represents CIRB data while orange curve represents data from U.S. Census Bureau and also the same comparison is illustrated in Table 2. Data from both sources were very close and the difference between them is attributed to the method of data collection because the U.S. Census Bureau is using a cut-off sampling design method while CIRB is collecting and adding all the data they can get from all counties in California. Another observation is clear in Figure 5 regarding the declining trend line (dotted orange line) for the total number of residential building permits of the U.S. Census Bureau data. During the sixties, seventies and eighties, the total number of residential building permits in California fluctuated around 200,000 building permits annually peaking in certain years at just over 300,000 building permits. However, from the nineties moving forward, trend reduced to around 100,000 building permits. The effect of this decline can be seen in the current known housing shortage in California and associated social and economic implications.

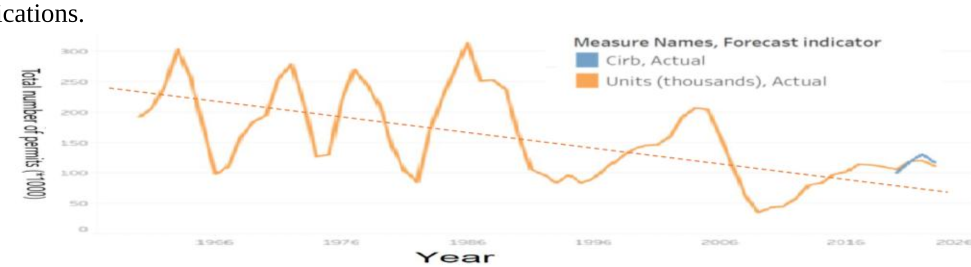

Figure 5. Comparison between data of CIRB & the U.S. Census Bureau.

Table 2. Comparison between data of CIRB & the U.S. Census Bureau.

Year	# of BPs according to CIRB	# of BPs according to U.S. Census Bureau
2020	100.665	106.000
2021	118.496	119.000
2022	131.034	121.000
2023	117.760	112.000

According to conducted literature review, the research team identified some economical indices that can be correlated to BPs. This data includes mortgage rates (data from Freddie Mac), home sales volume (data from Redfin), overall inflation and unemployment rate (data from U.S. Bureau of Labor Statistics). Using time series analysis to visualize and compare total residential BPs from CIRB (single family + multi-family units) and overall inflation from January 2020 until December 2022. As shown in Figure 6, When inflation was low from January 2020 until March 2021 (Start of COVID-19), BPs curve inclined to match the high demand for housing at that time. But once the inflation rate peaked (9.06% in June 2022,) a sharp decline for BPs curve became clear as the high inflation rate caused a decrease in construction activity and BPs. Based on these observations, correlation between residential BPs and overall inflation was investigated as shown in Figure 6. A polynomial trend line was utilized because it demonstrates a higher R^2 value (coefficient of determination which is a statistical measure that shows how well a regression model fits data) as shown in Table 3 compared to other trend line options. Then the correlation coefficient (R) (which is a statistical measure that describes strength and direction for relationship between two variables) was acquired by calculating the square root of the R^2 value. Coefficient of determination (R^2) was assessed for the relationship between BPs and overall inflation based on utilized polynomial trend line using the interpretation of Ozili (2023) as shown in Table 3 and it was found that R^2 value is acceptable.

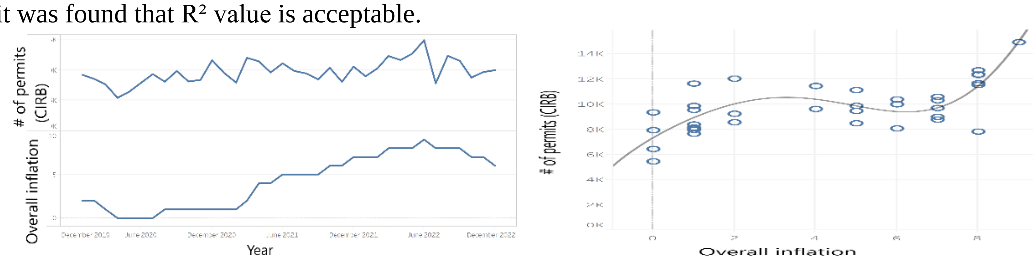

Figure 6. Analysis of residential BPs from CIRB & overall inflation (left), Correlation between residential BPs from CIRB & overall inflation (right).

By comparing the total number of residential BPs from CIRB and unemployment rate as shown in Figure 7. It was clear that there is a relationship between both measures, especially when the unemployment rate peaked from 3.6 % to 14.8% between January 2020 to April 2020 while BPs had a sharp decline from 9231 BPs in January 2020 to 5442 BPs only in April 2020. However, when the unemployment rate declined gradually afterwards, BPs inclined from 5442 BPs in April 2020 to 14924 BPs in June 2022. Based on these observations, correlation between residential BPs and unemployment rate was investigated as shown in Figure 7. A polynomial trend line was utilized because it demonstrates a higher R^2 value as shown in Table 3 compared to other trend line options. It was determined that this polynomial trend line acquired an acceptable R^2 value for describing the relationship between BPs from CIRB and unemployment rate (Ozili (2023).

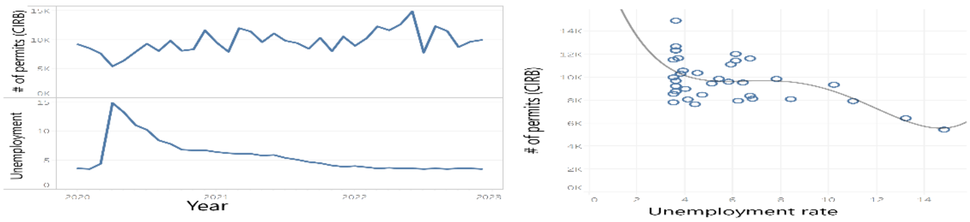

Figure 7. Analysis of residential BPs from CIRB & Unemployment rate (%) (left), Correlation between residential BPs from CIRB & Unemployment rate (%) (right).

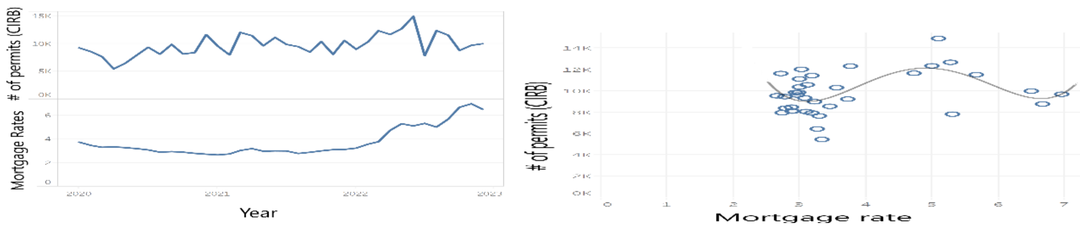

Figure 8. Analysis of residential BPs from CIRB & Mortgage rates (left), Correlation between residential BPs from CIRB & Mortgage rates (right).

By comparing the total number of residential BPs from CIRB and mortgage rates as shown in Figure 8. Mortgage rates remained low (around 3%) during COVID-19 period from January 2020 until April 2022 and at the same time the number of BPs was flat with some fluctuations. However, when mortgage rates inclined to be more than 5%, a sharp decline in BPs was noticed from 14924 BPs in June 2022 to 7817 BPs only in July 2022 because if mortgage rates are increasing, the demand for new buildings and BPs will decline. Based on these observations, correlation between residential BPs and mortgage rates was investigated as shown in Figure 8. a polynomial trend line was utilized because it demonstrates a higher R^2 value as shown in Table 3 compared to other trend line options. It was determined that this polynomial trend line acquired an acceptable R^2 value for describing the relationship between BPs from CIRB and mortgage rates (Ozili (2023). By comparing the total number of residential BPs from CIRB and home sales volume from Redfin as shown in Figure 9. It was apparent that both measures are correlated since both curves are declining or inclining at the same time. For example, both measures declined sharply in April 2020 after president Trump declared COVID-19 a national emergency in March 2020. Both curves inclined in July 2020, March and June 2021, as well as March and August 2022. Both curves declined in February 2021, as well as January and October 2022. Based on these observations, correlation between residential BPs and home sales volume was investigated as shown in Figure 9. A polynomial trend line was utilized because it demonstrates a higher R^2 value as shown in Table 3 compared to other trend line options. It was determined that this polynomial trend line acquired an acceptable R^2 value for describing the relationship between BPs from CIRB and home sales volume (Ozili (2023).

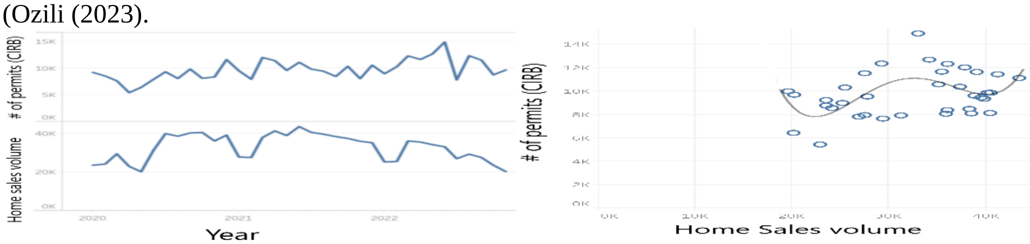

Figure 9. Analysis of residential BPs from CIRB & home sales volume (left), Correlation between residential BPs from CIRB & home sales volume (right).

Table 3. Correlation between residential BPs from CIRB & different indices

Indices	Type of trend curve	R^2	R	Interpretation of the R^2 Ozili, P.K., (2023)
Overall Inflation	Polynomial	0.57	0.75	(acceptable)
Unemployment Rate	Polynomial	0.32	0.56	(acceptable)
Home Sales Volume	Polynomial	0.24	0.49	(acceptable)
Mortgage Rate	Polynomial	0.28	0.53	(acceptable)

Granger Causality Test

Previously identified correlations does not automatically indicate that change in one variable is the cause for change in another variable. However, Causation means that change in specific variable is resulting from the change in another variable suggesting a causal relationship between the two variables. Granger causality test is utilized to identify the causal relationship between residential BPs from CIRB and different indices as shown in Table 4. RStudio statistical software was utilized to conduct Granger causality test, and the resulting P-values are shown in Table 4. "P-values are continuous indices of the strength of evidence against the null hypothesis" (Das & Das, 2023). P-values can be interpreted as $P > 0.10$, not significant; $P \leq 0.10$, marginally significant; $P \leq 0.05$, significant; and $P \leq 0.01$, highly significant (Das & Das, 2023). Based on P-values mentioned in Table 4, causality relationships between (Residential BPs →Overall Inflation) & (Mortgage Rate → Residential BPs) are significant, while causality relationships between (Unemployment Rate→ Residential BPs) & (Home Sales Volume → Residential BPs) are considered marginally significant.

Table 4. Results of Granger Causality Test between residential BPs from CIRB & different indices

Causality relationship between	P-Value	Interpretation of P-Value
Residential BPs →Overall Inflation	0.02	Significant causal relationship
Unemployment Rate→ Residential BPs	0.08	marginally significant causal relationship
Home Sales Volume → Residential BPs	0.06	marginally significant causal relationship
Mortgage Rate → Residential BPs	0.03	Significant causal relationship

Forecasting

Forecasting capabilities of Tableau software were investigated for the number of BPs from January until December 2022 based on actual CIRB data for total residential BPs in California from January 2020 until December 2021. Forecasts as shown in Figure 10 illustrate an average blue trendline for forecasts surrounded by light blue area that would include a range of different forecasts every month. After comparing the actual number of BPs from January until December 2022 as shown in Figure 11 to forecasts of the same period. It was noted that all actual number of BPs laid inside the forecasted light blue area every month except for BPs in June 2022, when it was forecasted (based on the upper range) to be around 14500 BPs, but actually it was 14924 BPs. Forecasting was conducted also for the number of residential BPs until the end of 2024 as shown in Figure 11. The overall forecasting capabilities of Tableau software were found to be reasonable, noting that Tableau utilizes exponential smoothing models to predict quantitative time-series data. These models seize seasonality or trends of data to extrapolate it into the future. These models also consider more weight to recent data compared to older ones, however one of its limitations that it might not be suitable for datasets with irregular patterns or structural breaks. Prediction intervals - which indicates the range around the forecasted value to reflect uncertainty of the prediction- were set to 99% which indicates a 99% probability that the actual value will fall within the range (light blue area).

Discussion

This paper investigated trends and characteristics of building permits in California based on the data provided by Construction Industry Research Board (CIRB) of the California Homebuilding Foundation (CHF). This data included many types of building permits categorized into 31 unique building codes.

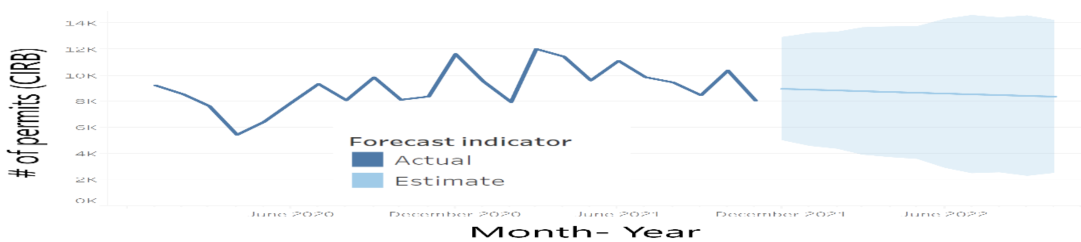

Figure 10. Forecasting for residential BPs from CIRB using Tableau software

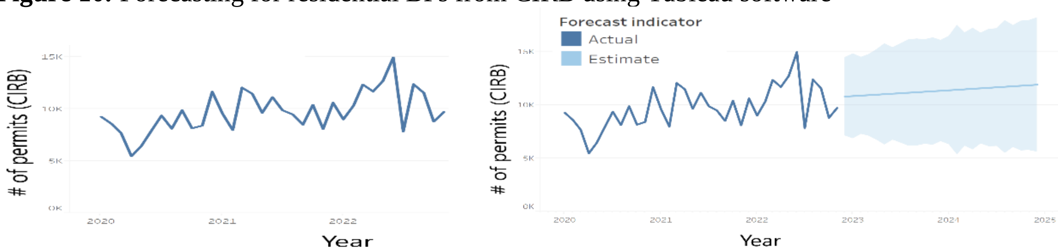

Figure 11. Actual residential BPs from CIRB using Tableau software (left), Forecasted number of residential BPs until the end of 2024 using Tableau software (right).

These building codes included traditional BPs such as single-family residential permits, private schools, libraries, museums, industrial buildings and utilities. As well as new types of BPs such as accessory dwelling units (ADU), solar new residential structure, electric vehicle chargers and stations, etc. Tableau software was utilized to analyze data using different techniques for mapping, time series analysis, and forecasting. Residential BPs per county were compared as well as their valuation to the GDP, population and total land area in square miles for each county. From mapping analysis, it was concluded that northern California is building significantly less than the rest of the state. The main areas of construction are Southern California and the Bay Area. Tableau software provided useful visualization to BPs in different counties, and this option would be great if it could be added later to the developed academic portal by CIRB. After comparing residential BPs to population and total land area of each county. The number of BPs and its valuation were found to be linked to overall inflation, mortgage rates, home sales volume and unemployment rate. Hence, BPs are considered one of the best general indices for building activity as Cover (1932) indicated.

Conclusion

It was concluded that counties with high total number of BPs such as LA might not present a high percentage of BPs relevant to its population and total land area compared to other counties like Sacramento that would have more BPs compared to its population and total land area and this fact explains the current housing shortage existing in LA and relevant to its high population. The reason for housing shortage also was clear after comparing CIRB data to residential building permits of the U.S. Census Bureau data because the total number of residential building permits in California in the sixties, seventies and eighties was found to be around 200,000 BPs annually and in certain years it can even reach 300,000 building permits. However, from the nineties moving forward, this number is around 100,000 BPs only and this fact was visualized in a declining trend line for BPs from 1960 until 2023. Time series analysis and polynomial regression analysis showed the relationship and correlation between BPs and overall inflation, unemployment rate, mortgage rates and home sales volume. It was found that there is a correlation between BPs and overall inflation, mortgage rates, home sales volume and unemployment rate and there is a significant causal relationship between BPs and each of overall inflation and mortgage rates as well as a marginally significant causal relationship between BPs and each of home sales volume and unemployment rate. Forecasting capabilities of Tableau software were found to be reasonable for predicting the range of possible total number of BPs. It was also concluded that some counties do not have a structured policy to submit data to other organizations such as CIRB, and it would be helpful to endorse such a policy in all counties to enhance data collection process that would facilitate data analysis for BPs to get a better understanding for construction industry trends and characteristics which is very helpful for policy makers. One of the Limitations of this research that it's using a simplified method for forecasting BPs, and future work may include sophisticated methods for forecasting such as ARIMA (AutoRegressive Integrated Moving Average) models as well as studying the relationship between valuation and BPs numbers in more detail.

Acknowledgement

The authors of this paper acknowledge the Construction Industry Research Board (CIRB) of the California Homebuilding Foundation (CHF) for their support by providing the necessary data and funding for this research, and special thanks to Terri Brunson, Joe Sanchez, Victoria Reyes & John Thatch. With a rich history dating back to 1978, CHF has channelized over $3.5 million towards research initiatives, supporting pivotal industry studies that present viable solutions to the housing crises gripping the state. (CIRB) stands as the preeminent statistical resource for the entire State of California. Its role in providing indispensable data to various state agencies and universities underscores its significance in shaping informed decisions within the realm of construction and housing.

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