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TSA DATA SCIENCE AND ANALYTICS DOCUMENTATION

KATY, TX
NATIONAL IDS: 877494, 977307
CHAPTER 1782

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INTRODUCTION & DATA OVERVIEW

The U.S. housing market is strongly connected to overall economic performance, with changes in housing prices often indicating broader economic shifts. This connection is explored through various markets, including the housing, stock, and commodity markets, as well as inflation via the Consumer Price Index (CPI). Key indicators used in the study include the Housing Price Index (HPI) for housing, the S&P 500 for the stock market, and gold prices for the commodity market.

Studies, such as those by Robert Shiller, highlight how dramatic shifts in the housing market, like the rise in prices before the 2008 crash, can trigger economic instability by affecting household wealth, consumption, and borrowing. A decline in housing prices can lower wealth and consumer confidence, leading to reduced spending and an economic slowdown. Conversely, rising house prices can increase household wealth and spending, driving economic growth. Housing market trends also often align with stock market performance, suggesting that changes in housing prices could predict broader market trends.

This has led many economists to wonder: How can we use the housing market to predict the economy? Through advanced data analysis techniques such as correlation and lag analysis, this research will explore the strength and timing of these correlations. Understanding these relationships will help policymakers and investors make more informed decisions, potentially allowing for more effective responses to economic downturns and accelerating recovery during market corrections.

DATA DICTIONARY

Field Name	Data Type	Description	Field Example
Date	Date	The data collection date (MM/DD/YYYY)	09/18/2008
CPI	Float	The consumer price index	109.28
HPI	Float	The housing price index	213.36
S&P500	Float	The closing price of the S&P500 market index (USD)	1284.47
Gold Price	Float	The value of gold (USD)	932.47

PURPOSE

 Gaining an understanding of the predictive power of housing prices enables policymakers to adjust fiscal and monetary policies appropriately, while it also enables investors to make more informed decisions about market positioning. According to Leamer, 2007, "housing markets are central to the business cycle, influencing economic stability and growth" (p. 6.) For example, when house prices increase rapidly they may point to an overheated economy, which would prompt the central banks to increase interest rates to dampen inflation. In a situation where such prices decline, this could signal a slowdown and compel policymakers to employ stimulus policies. These house price trends need to be closely watched by the policymakers and investors so that decision-making can be without many risks of economic volatility or advantageous during boom periods.

The relationship between housing price data and other economic indicators were analyzed in the following contexts:

- HPI as a Predictor of GDP Growth
- HPI's Relationship with Inflation
- HPI's Connection to Stock Market Performance
- HPI's Impact on Commodity Trends

By Comparing the data on housing markets to other datasets, we can gain insight as to how the price of homes can influence or predict other economic trends that America could be facing.

METHODS

Our research relied on secondary data collection and statistical simulations to analyze economic indicators. Secondary data was gathered from five sources: the SEC, FHFA, BLS, the World Bank Group, and the St. Louis Federal Bank. Data was selected based on the criteria of being recent (post-1990) to ensure relevance. The data was processed and cleaned to make it suitable for analysis.

Data Cleaning:

Economic data for HPI, S&P 500, CPI, and GDP was reformatted for consistency and analysis. HPI data after 10/1/2017 was removed, and dates were adjusted to MM/DD/YYYY. The S&P 500 Index was reformatted for easier analysis, while CPI was averaged annually with entries before 1990 removed. GDP data was adjusted similarly, using nominal values and MM/DD/YYYY format, with entries before 1991 excluded. All data was converted into CSV format. These transformations standardize the data, making it suitable for correlation and regression analysis.

Analysis Methods

Pearson's Correlation: Measures the linear relationship between two datasets, such as HPI and CPI. By calculating deviations from the mean and finding the Pearson coefficient (r), we determine the strength of the relationship. A value close to 1 indicates a strong positive relationship, while near -1 suggests a negative one.

Cross-Correlation: Examines how changes in one time series (e.g., CPI) relate to another (e.g., HPI) at different times. This helps identify delayed effects, such as whether CPI changes precede HPI changes, providing insights into the timing of economic impacts.

Lag Analysis: Examines how values of one variable, like GDP or S&P 500, precede or succeed a change in another variable, such as housing prices or inflation, over time. By analyzing different lags, it identifies key timeframes where relationships are strongest, helping to forecast trends and economic cycles.

RESULTS

(1) HPI as a Predictor for GDP Growth

The data was converted into a double line graph to see the relationship between HPI and GDP. The following figures depict this relationship.

[1]

GDP Vs. HPI
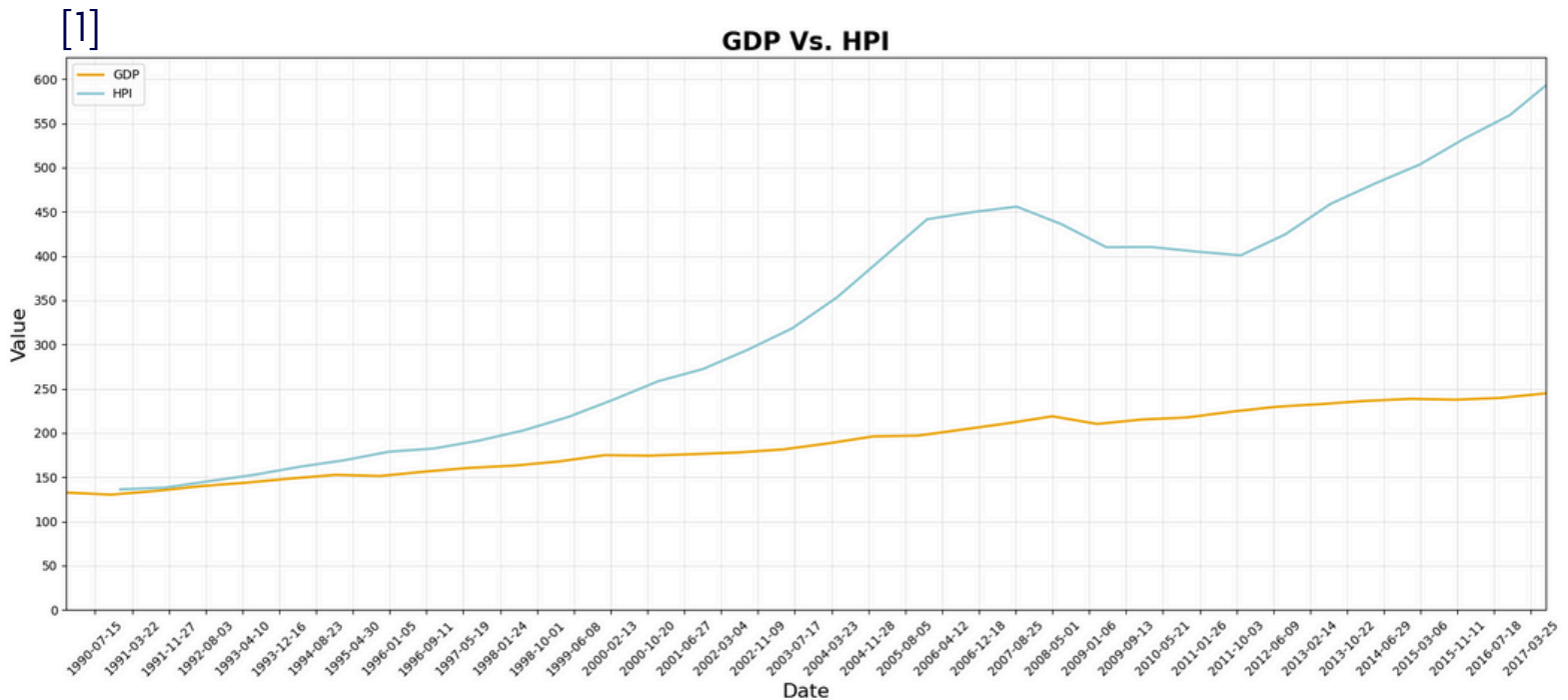
[2]	
Slope	3.8607258258229145
Y-Intercept	-405.04860405010777
Correlation	0.9701185096444789
Coefficient of Determination	0.9411299227548249

Looking at Figure 1, we can observe a general positive relationship between the Housing Price Index (HPI) and Gross Domestic Product (GDP). This suggests that when HPI increases, GDP tends to increase as well, indicating that the two variables often move in the same direction.

The statistical summary in Figure 2 further confirms this strong relationship, with a correlation of 0.97. This high correlation indicates a robust positive connection between HPI and GDP, meaning that changes in one are closely associated with changes in the other. Additionally, the slope of the regression line is 3.861, meaning that, on average, for every 1-point increase in GDP, HPI is predicted to increase by 3.861 points. This suggests a substantial and consistent relationship between the two variables.

Overall, the data indicate a strong, positive relationship between HPI and GDP, making HPI a useful indicator for understanding trends in economic output.

The following graph (Figure 3) is a lag analysis on the GDP data set and the HPI data set.

[3]
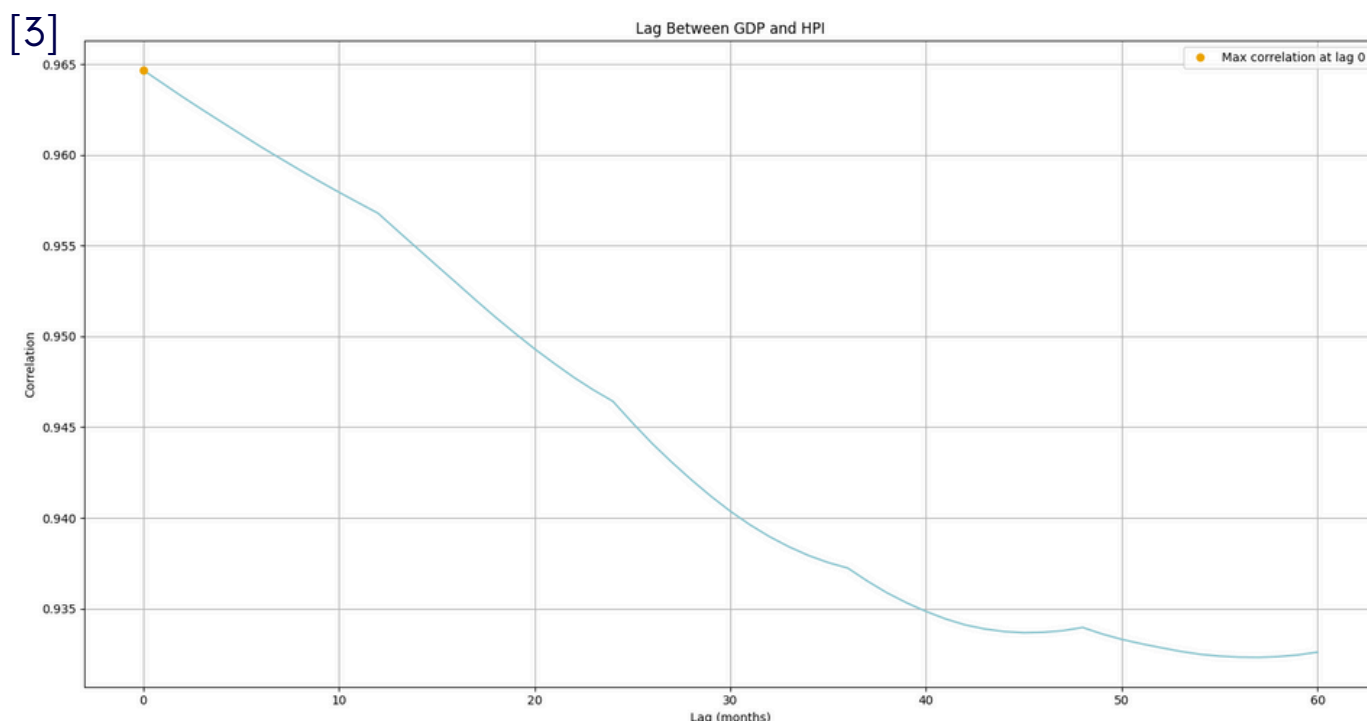
By analyzing the lag between the Housing Price Index (HPI) and Gross Domestic Product (GDP) and creating a graph (Figure 3), we can observe that the maximum correlation occurs when the lag is 0 months. This indicates that changes in HPI and GDP tend to happen at the same time, suggesting a direct, immediate relationship between the two variables.

The graph also reveals that as the lag increases, the correlation between HPI and GDP decreases. This means that it becomes less likely for changes in HPI to be followed by changes in GDP, or vice versa, as the time gap grows. This weakening correlation over time suggests that the relationship between HPI and GDP is strongest when the changes occur simultaneously but becomes less reliable as the delay between the variables increases.

(2) HPI's Relationship with Inflation

The following figures are the HPI data set and Inflation data set represented as a double line graph and statistic summary to view the relationship between them as well as the correlation.

[4]
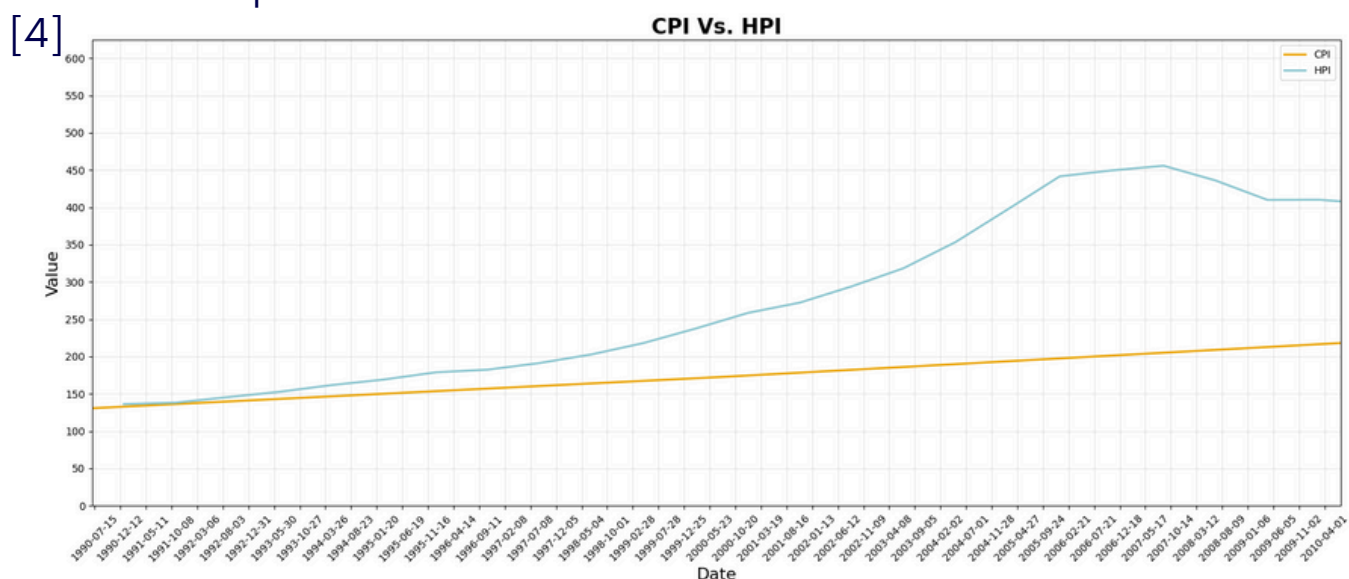
[5]

Slope	3.8699148165553905
Y-Intercept	-407.034536432598
Correlation	0.969129991710866
Coefficient of Determination	0.9392129408335032

Looking at Figure 4, we can observe a general positive relationship between the Housing Price Index (HPI) and the Consumer Price Index (CPI). This trend indicates that when HPI increases, CPI tends to rise as well, showing a tendency for the two variables to move in the same direction.

The statistical summary in Figure 5 further confirms this strong relationship, with a correlation of 0.97. This high correlation suggests a robust positive connection between HPI and CPI, meaning that changes in one are closely tied to changes in the other.
Additionally, the slope of the regression line is 3.87, indicating that, on average, for every 1-point increase in CPI, HPI is predicted to increase by 3.87 points. However, it is important to note that this is just an average, and the actual relationship between HPI and CPI can vary in specific instances.

Overall, the data suggest a strong, positive relationship between HPI and CPI. Given this connection, HPI can be a useful tool for estimating CPI trends, providing valuable insights into potential future inflation or price movements.
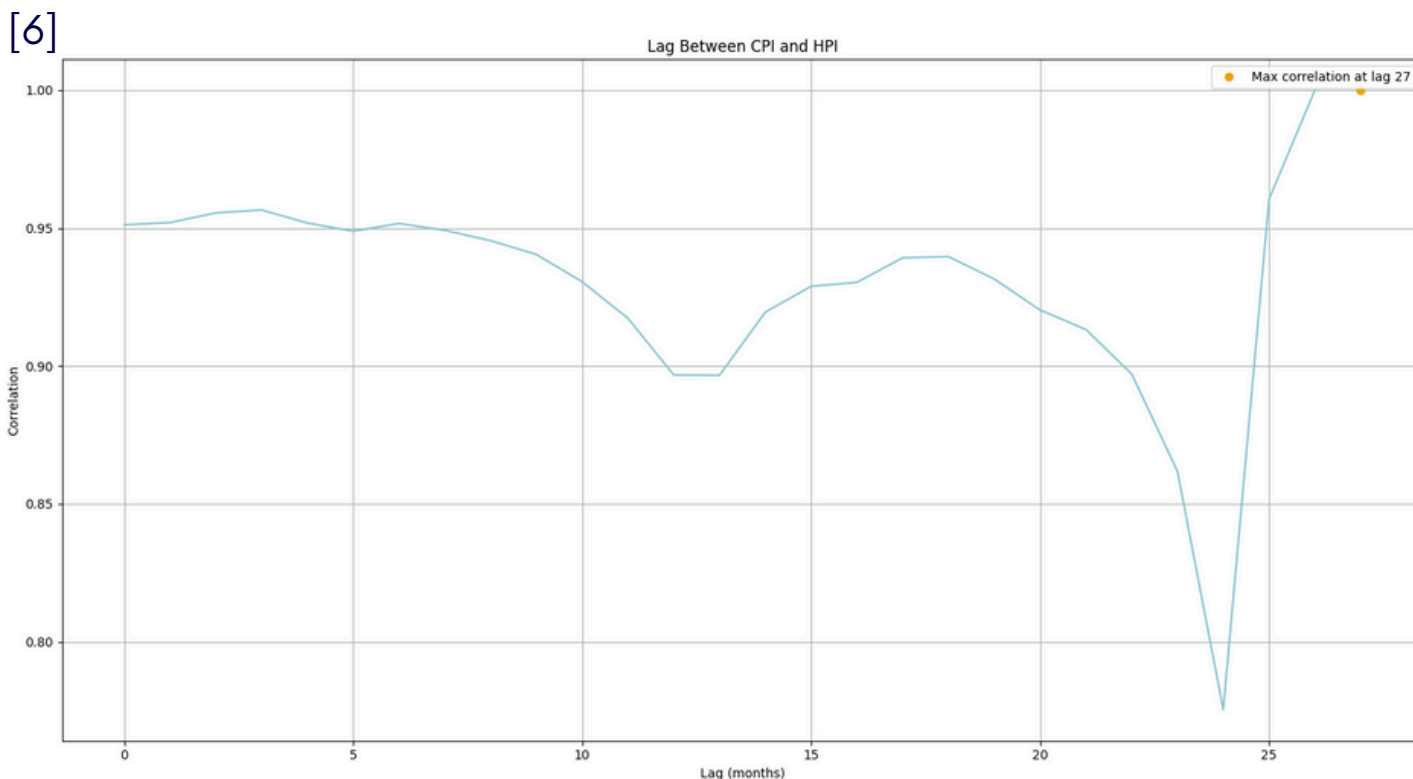
[6]

Figure 6, which shows the lag between the Consumer Price Index (CPI) and the Housing Price Index (HPI), reveals that the maximum correlation between the two datasets occurs when the lag is 27 months. This means that, in general, changes in CPI are followed by changes in HPI approximately 27 months later.

However, it is important to recognize that this is only a general trend, and there are times when the lag may be shorter or longer. For instance, during months between –10 and 15 or 20 months, the lag may vary. This variability in the lag value means that HPI can be used to predict CPI within a range of 0 months to 2 years into the future. Such a prediction window offers economists ample time to anticipate potential shifts, including adjustments in inflation rates, and to prepare accordingly.

(3) HPI's Connection to Stock Market Performance [7]

S&P500 Vs. HPI
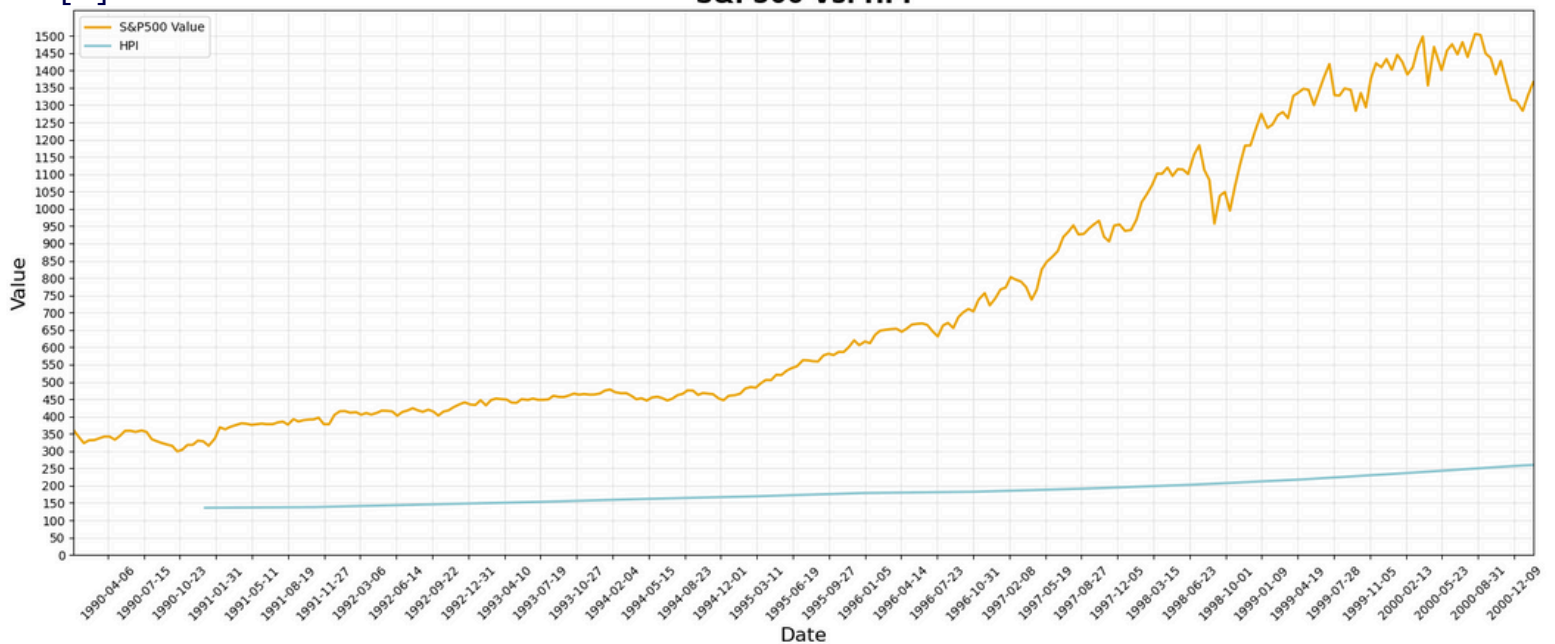
[8]

Slope	0.0835786571195808
Y-Intercept	116.91745188548781
Correlation	0.97037907960312
Coefficient of Determination	0.9416355581313982

Figure 7 explores the relationship between housing prices (HPI) and the stock market (S&P 500), showing that both generally rise over time. This suggests that the two variables tend to move in similar directions, with increases in one often corresponding to increases in the other.

Statistical analysis in Figure 8 further highlights the strong connection between HPI and the S&P 500. For every 1-unit increase in the S&P 500, HPI tends to rise by about 0.08 units. The correlation of 0.97 is very high, indicating that the two variables usually move together. In fact, changes in the S&P 500 explain about 94% of the changes in HPI, demonstrating that the stock market has a significant influence on housing prices.

This strong relationship means that economists can use HPI to estimate the direction of the stock market, as well as to gauge whether the market is in a bullish or bearish phase. By observing trends in HPI, economists can gain valuable insights into the likely movements of the broader stock market.
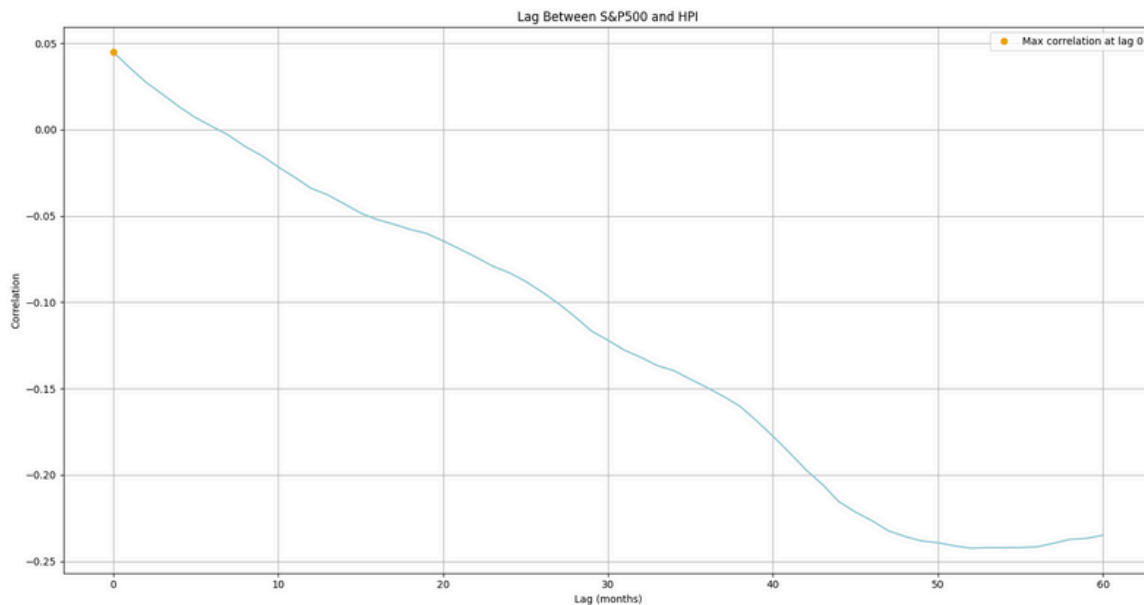
Figure 9 illustrates how the correlation between the S&P 500 and the Housing Price Index (HPI) changes over time, specifically in relation to different lags. The graph shows that the highest correlation between the two datasets occurs when the lag is 0 months. This indicates that the S&P 500 and HPI tend to move together at the same time, suggesting a close and immediate relationship between the two variables.

As the lag increases, the correlation between the datasets decreases. This means that the relationship between the S&P 500 and HPI weakens as there is a delay between the changes in the two variables. The data suggests that, over time, the two datasets are less likely to move in synchrony as the lag grows.

Overall, the graph points to a strong, positive relationship between the S&P 500 and HPI, especially when the two variables change concurrently. For economists, this means that changes in HPI can serve as an early indicator of market movements in the S&P 500, offering a valuable tool for predicting near-term changes in the stock market.

(4) HPI's Impact on Commodity Trends

Because gold prices represent the commodity market well, we decided to use those for simplicity and the fact that gold prices are open sourced and tracked for longer which will help us gain a more accurate insight into this relationship.

[10]

Gold Prices Vs. HPI
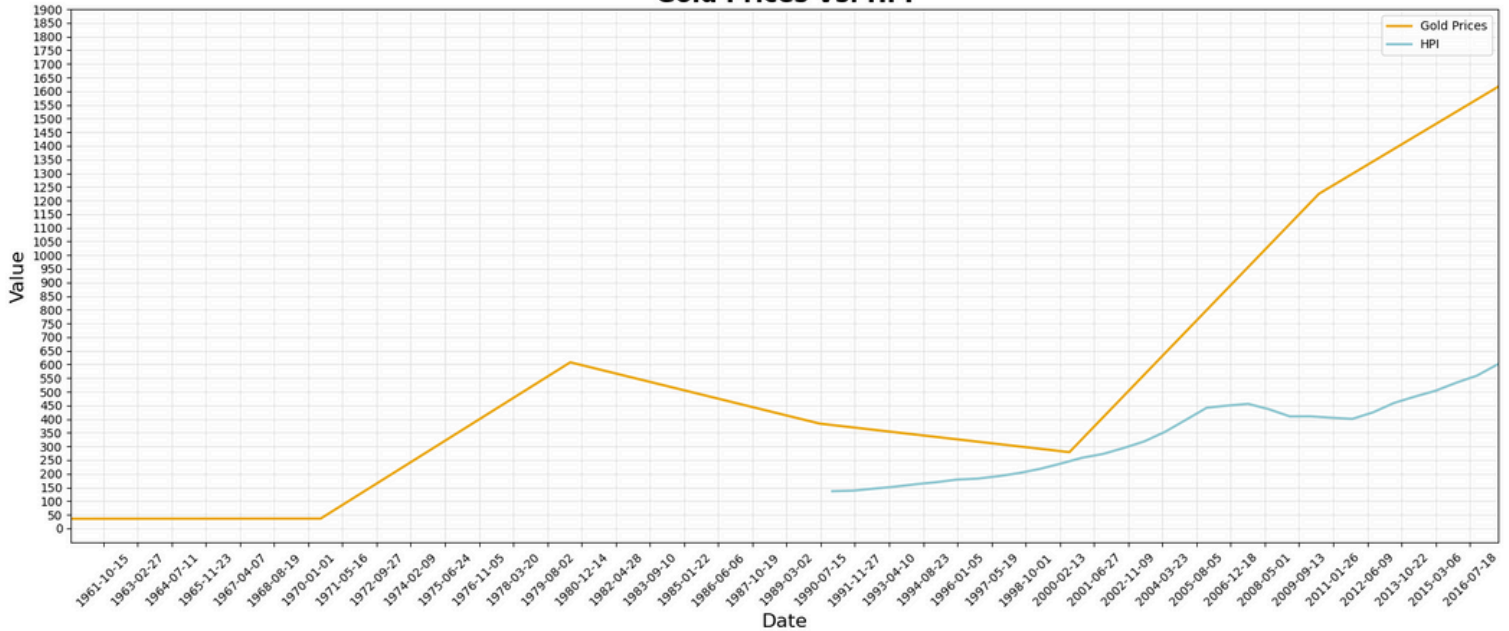
[11]

| Slope	0.2285139934956526
Y-Intercept	171.7098535883964
Correlation	0.9682011888482889
Coefficient of Determination	0.9374135420872399

Figure 10 shows how both gold prices and the Housing Price Index (HPI) have changed over time, allowing us to observe if they generally move in the same direction. The visual trend indicates that there is a noticeable pattern between the two variables.

To better understand the relationship between HPI and gold prices, Figure 11 provides some key statistics. The slope of 0.23 tells us that for every 1-unit increase in HPI, gold prices are predicted to increase by about 0.23 units. This provides a quantitative measure of the connection between the two.

Additionally, the correlation of 0.97 reveals a very strong positive relationship between HPI and gold prices. This means that when HPI rises, gold prices tend to rise as well, and conversely, when HPI falls, gold prices tend to fall too. The high correlation value underscores the consistency of this trend.

Finally, the coefficient of determination, which is 0.94, indicates that about 94% of the changes in gold prices can be explained by changes in HPI. This suggests that HPI is a highly effective predictor of movements in gold prices, explaining nearly all of the variation in their changes.

[12]

Lag Between Gold Prices and HPI
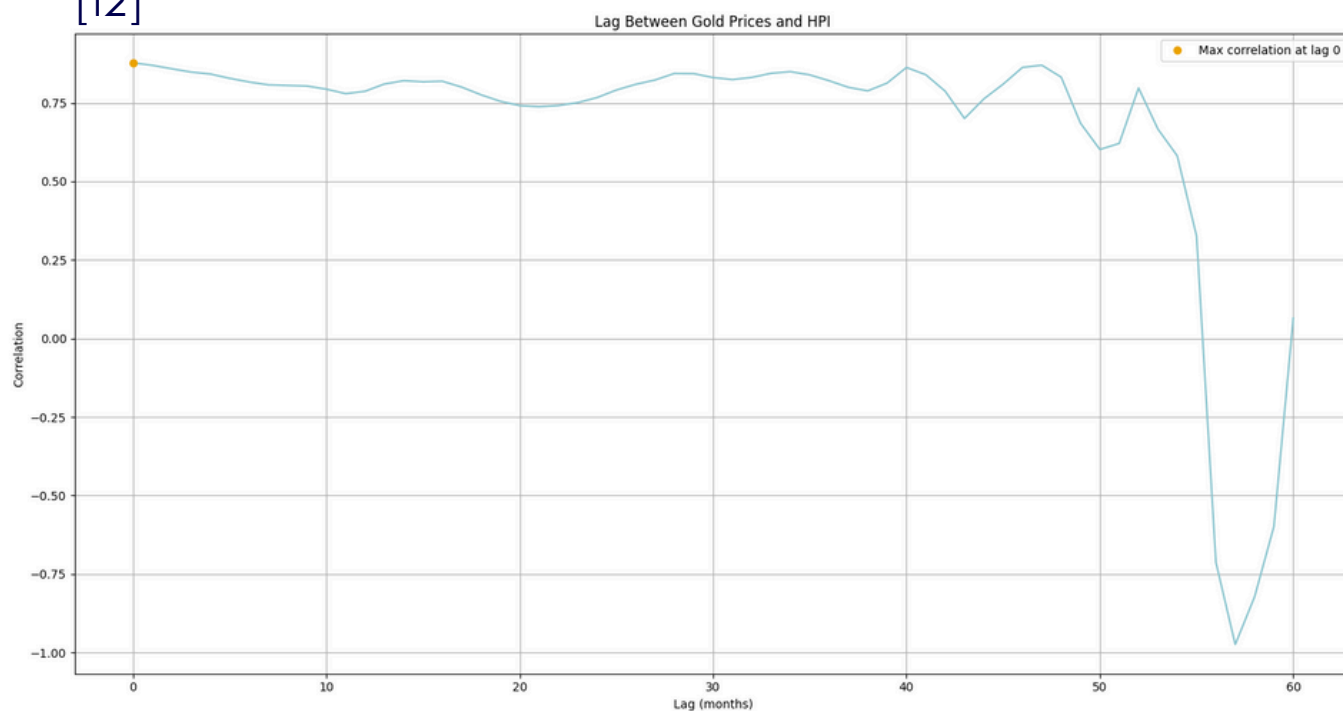
The analysis of the lag correlation between gold prices and the Housing Price Index (HPI) (Figure 12) reveals several key insights. The correlation is strongest when there is no lag between the two variables, meaning they tend to move together in the same direction at the same time. This indicates that, in the short term, changes in HPI are closely tied to changes in gold prices.

As the lag increases, however, the correlation between the two variables decreases. This suggests that the relationship weakens over time, with gold prices and HPI no longer moving in as close a synchrony. Despite this weakening, the correlation remains positive for the majority of the time, meaning that, generally, when one variable increases, the other tends to increase as well.

Interestingly, there is a brief period around a lag of 50 months where the correlation turns negative. During this time, gold prices and HPI tend to move in opposite directions, indicating a temporary reversal in their usual relationship.

Overall, while gold prices can serve as a useful indicator of HPI movements, the relationship between the two variables is complex. It is not consistent over time and can change depending on factors such as the length of the lag.

CONCLUSIONS

Housing Price Index (HPI) as an Economic Indicator

- A strong positive correlation exists between the HPI and GDP (correlation coefficient: 0.97), suggesting that changes in housing prices directly mirror economic output. HPI serves as a reliable predictor for GDP trends.

- Lag analysis indicates that HPI and GDP changes occur simultaneously, emphasizing HPI's real-time relevance in gauging economic conditions.

HPI and Inflation (CPI)

- The relationship between HPI and CPI is strong (correlation coefficient: 0.97). HPI trends align with inflation, revealing that rising housing costs significantly contribute to inflationary pressures.

- A lag of approximately 27 months was observed, where changes in CPI may eventually influence HPI trends. This provides a predictive window for policymakers to act on inflation adjustments.

HPI's Link to Stock Market Performance

- HPI correlates strongly with the S&P 500 index (correlation coefficient: 0.97). This indicates that housing prices and stock market performance often rise or fall in tandem, reflecting broader economic sentiment.

- Lag analysis reveals no delay in the correlation, underscoring the synchronous nature of housing and stock market movements.

CONCLUSIONS

HPI's Impact on Commodity Trends

- The Housing Price Index (HPI) has a strong correlation (0.97) with gold prices, indicating that changes in housing prices significantly impact commodity markets. Rising housing prices often signal economic stability and growth, driving demand for commodities like gold as investors gain confidence. Conversely, falling housing prices can point to economic uncertainty, leading investors to seek safe-haven assets like gold.

- While the HPI and commodity prices show a strong relationship in the short term, this correlation weakens over longer periods, suggesting that the HPI provides valuable short-term insights into commodity movements but has limited predictive power for long-term trends.

Policy and Investment Implications

- The HPI is a crucial indicator of economic health, offering insights into consumer confidence, financial stability, and broader economic conditions. Policymakers can use HPI trends to assess the effectiveness of fiscal and monetary policies, adjusting strategies when necessary, such as responding to a drop in housing prices with measures like interest rate cuts or stimulus packages.

- For investors, HPI data helps anticipate shifts in various markets, including equities, bonds, and commodities, enabling portfolio adjustments. While the HPI is useful for short-term predictions, long-term strategies should incorporate other economic indicators to ensure a more comprehensive outlook.

NEXT STEPS

Expanding Research to Other Economies

- This project focuses on the U.S. economy, but further research is needed on the relationship between HPI and economic health in other countries. Differences in socioeconomic structures, government policies, and market dynamics may lead to varying patterns. Comparative studies could help determine if HPI is universally reliable or region-dependent.

Advanced Modeling Techniques

- Future research should incorporate machine learning models like Random Forest or Neural Networks to capture non-linear relationships between HPI and economic indicators (e.g., GDP, CPI, stock market). Combining traditional methods with machine learning will improve forecast accuracy, aiding policymakers and investors.

Localized Analysis

- Shifting focus to smaller scales, such as regions or communities, can offer insights into regional variations in housing price trends. These differences may reflect local economic policies, industries, and demographics, helping to understand urban vs. rural market dynamics.

Pilot Testing and Policy Implementation

- Once refined, the methodology can be tested locally (e.g., within a county or city) to guide tailored policies on housing affordability, growth, or inflation. If successful, it could scale up to state, national, or global levels to improve economic conditions worldwide.

SCIENTIFIC POSTER

Leveraging Housing Prices To Predict The Future Economy

Team IDs: 877494, 977307

Gulf Coast Regional Conference 2025

Introduction

The U.S. housing market is closely tied to overall economic performance, with housing price fluctuations often signaling broader economic shifts. Studies, such as those by Robert Shiller, show that changes in housing prices can impact household wealth, consumption, and borrowing, influencing economic stability. By analyzing these relationships, researchers aim to better predict economic trends and improve decision-making for policymakers and investors.

Purpose

The purpose of this research is to explore how housing price trends can predict broader economic shifts, aiding policymakers in adjusting fiscal and monetary policies and helping investors make more informed decisions. As Leamer (2007) emphasizes, housing markets are central to the business cycle and influence economic stability and growth. By comparing housing data with other economic datasets, this research aims to uncover how housing prices may signal upcoming economic trends, guiding decision-making during both periods of slowdown and growth.

Methods

Our research relied on secondary data collection and statistical simulations to analyze economic indicators. Secondary data was gathered from five sources: the SEC, FHFA, BLS, the World Bank Group, and the St. Louis Federal Bank. Data was selected based on the criteria of being recent (post-1990) to ensure relevance. The data was processed and cleaned to make it suitable for analysis.
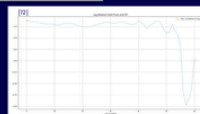
Results

HPI and GDP: Strong correlation (0.97) with immediate effects, reflecting HPI's reliability as a real-time economic indicator (Graph: HPI vs. GDP).

HPI and CPI: Positive relationship (0.97), with a predictive lag of 27 months, showing housing's role in inflation trends (Graph: HPI vs. CPI).

HPI and Stock Market: Correlation with S&P 500 (0.97), indicating synchronized trends (Graph: HPI vs. S&P 500).

HPI and Commodities: Short-term influence on gold prices (0.97 correlation), diminishing over longer timeframes (Graph: HPI vs. Gold).

Results
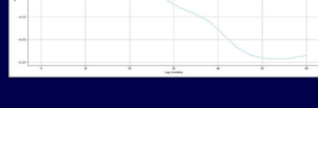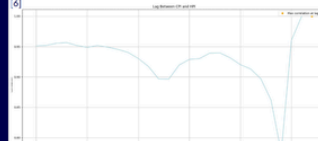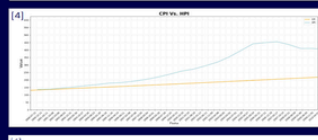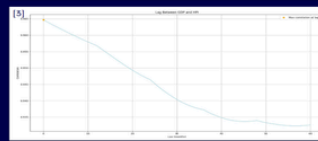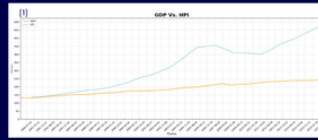
Conclusion

HPI shows strong correlations with major economic indicators, confirming its effectiveness as an economic predictor. Its relationships with GDP, CPI, stock markets, and commodities provide actionable insights for managing inflation, adjusting fiscal policies, and investment decisions.

Next Steps

1. Expand research to include other economies to test HPI's universality
2. Develop machine learning models for more accurate forecasts
3. Conduct localized studies to assess regional impacts and disparities
4. Pilot test refined models at a local scale to inform policies
5. Create global frameworks to analyze economic conditions collaboratively

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APPENDIX

ALL CODE FILES, EXCEL WORKBOOKS, CSV FILES, ETC. CAN BE FOUND HERE
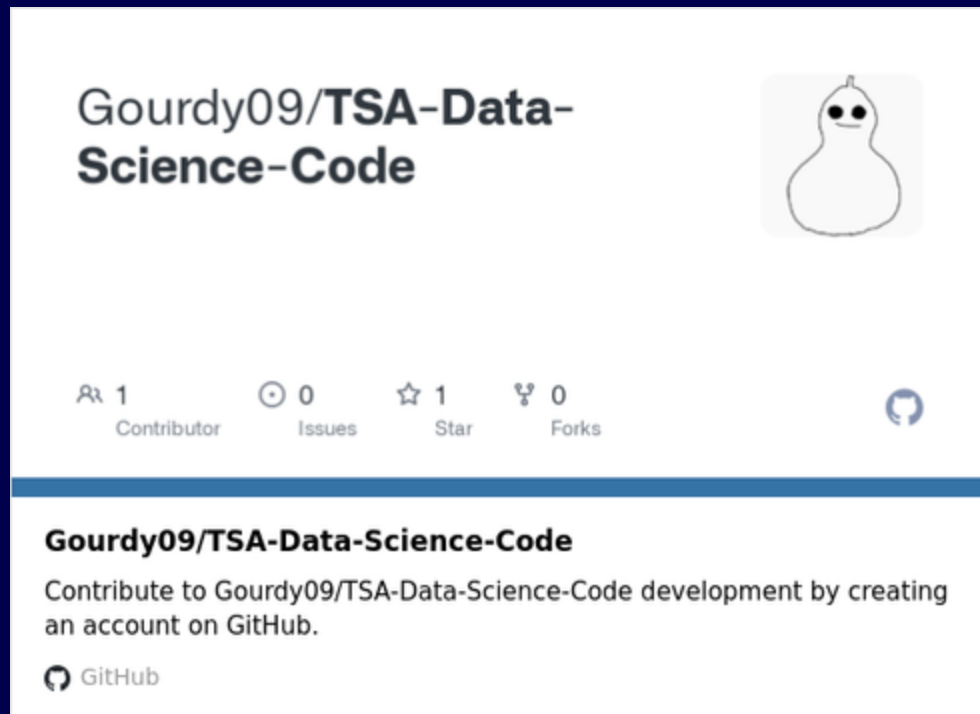
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I hereby give permission for images of my child or myself (as applicable), captured during Technology Student Association (TSA) activities through film, photo or digital camera, to be used solely for the purposes of TSA promotional materials and publications, and I waive any rights of compensation or ownership thereto.

Om Patel
_____
Name of Minor in Images (please print)

Mitaliben Patel
_____
Name of Minor's Parent/Guardian (please print)

N/A
_____
Name of Adult in Images (please print)

Mitaliben Patel
_____
Parent/Guardian or Adult's Signature (as applicable)

1/21/2025
_____
Date

Student and Parent Consent and Release Form

As TSA develops and integrates more technology-centered tools to enhance its competitions and prepare our chapter members to meet the demands of a technologically challenging landscape, we require an understanding of and adherence to the guidelines set forth below. This includes the use of personal student email accounts to access online collaborative tools and instructional guides. **School assigned email addresses are not to be used.** Members who do not submit a completed form will not be eligible to access TSA tools or participate in online TSA competitive events.

PARENTAL PERMISSION AND RELEASE

I __Mitaliben Patel_____, the parent/legal guardian of __Om Patel_____("my child"), give permission to use my child's personal email account to access the TSA online platform and informational resources. I understand that this access is for educational use only, and it is the responsibility of my child to restrict use to such purpose. I accept full responsibility for supervision of my child. By signing this Consent and Release Form, I give permission for my child to use TSA resources to register for accounts designated by TSA.

I understand and acknowledge that accounts and platforms accessed by users are governed by the privacy terms (privacy policy) set by each platform. Student participation is also governed by the attached Acceptable Use Policy (AUP) and Third-Party Content Policy (3PCP). A website's privacy policy discloses ways a party gathers, uses, discloses, and manages user data. TSA does not have any control over other websites. Therefore, TSA is not responsible for the protection and privacy of any information or materials that my child or I provide, or to which my child and I am exposed, while visiting such sites.

I have reviewed this Consent and Release Form and the attached AUP and 3PCP, and I hereby release **Technology Student Association**, its employees, agents, and volunteers, from any and all liability, claims, demands, causes of action, and possible causes of action whatsoever arising out of or related to any loss, damage, or injury that may be sustained by my child while making use of TSA-provided resources.

Mitaliben Patel   1/26/2025
_____
Parent or Guardian Name (please print)   Date

M. P Patel
_____
Signature

INTERNET AND ONLINE ACCESSIBILITY

I have reviewed this Consent and Release Form and the attached AUP and 3PCP and discussed them with my parent(s) and/or guardian(s) for the use of TSA resources. I will abide by the AUP and 3PCP, and the websites' privacy policies, will use these services for educational purposes only, and will restrict my use accordingly.

Om Patel   1/26/2025
_____
Student Name (please print)   Date

Om Patel
_____
Signature

PHOTO/FILM/VIDEO CONSENT AND RELEASE

I hereby give permission for images of my child or myself (as applicable), captured during Technology Student Association (TSA) activities through film, photo or digital camera, to be used solely for the purposes of TSA promotional materials and publications, and I waive any rights of compensation or ownership thereto.

Abraham Anantha

Name of Minor in Images (please print)

Rachel Anantha

Name of Minor's Parent/Guardian (please print)

N/A

Name of Adult in Images (please print)

Rachel Anantha

Parent/Guardian or Adult's Signature (as applicable)

1/21/25

Date

Student and Parent Consent and Release Form

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PARENTAL PERMISSION AND RELEASE

I ___Rachel Anantha___, the parent/legal guardian of ___Abraham Anantha___ ("my child"), give permission to use my child's personal email account to access the TSA online platform and informational resources. I understand that this access is for educational use only, and it is the responsibility of my child to restrict use to such purpose. I accept full responsibility for supervision of my child. By signing this Consent and Release Form, I give permission for my child to use TSA resources to register for accounts designated by TSA.

I understand and acknowledge that accounts and platforms accessed by users are governed by the privacy terms (privacy policy) set by each platform. Student participation is also governed by the attached Acceptable Use Policy (AUP) and Third-Party Content Policy (3PCP). A website's privacy policy discloses ways a party gathers, uses, discloses, and manages user data. TSA does not have any control over other websites. Therefore, TSA is not responsible for the protection and privacy of any information or materials that my child or I provide, or to which my child and I am exposed, while visiting such sites.

I have reviewed this Consent and Release Form and the attached AUP and 3PCP, and I hereby release **Technology Student Association**, its employees, agents, and volunteers, from any and all liability, claims, demands, causes of action, and possible causes of action whatsoever arising out of or related to any loss, damage, or injury that may be sustained by my child while making use of TSA-provided resources.

Rachel Anantha	1/26/25
Parent or Guardian Name (please print)	Date

Signature

INTERNET AND ONLINE ACCESSIBILITY

I have reviewed this Consent and Release Form and the attached AUP and 3PCP and discussed them with my parent(s) and/or guardian(s) for the use of TSA resources. I will abide by the AUP and 3PCP, and the websites' privacy policies, will use these services for educational purposes only, and will restrict my use accordingly.

Abraham Anantha	1/26/25
Student Name (please print)	Date

Signature

STUDENT COPYRIGHT CHECKLIST (for students to complete and advisors to verify)

STUDENT: Answer question 1 below.

1) Does your solution to the competitive event integrate any type of music and/or sound? [X] YES [ ] NO

   If NO, go to question 2.

   If YES, is the music and/or sound copyrighted? [ ] YES [X] NO

   If YES, move to question 1A. If NO, move to question 1B.

   1A) Have you asked for author permission to use the music and/or sound in your solution and included that permission (letter/form) in your documentation? If YES, move to question 2. If NO, ask for permission and if permission is granted, include the permission in your documentation.

   1B) Is the music/sound royalty free, or did you create the music/sound yourself? If YES, cite the royalty free music/sound OR your original music/sound properly in your documentation.

CHAPTER ADVISOR: Sign below regarding your student's answer(s) to the use of music/sound in his/her competitive event solution. Even if your student answers "NO" to question 1, please sign below noting that you have evaluated the competitive event solution and the student answered the question(s) accurately.

I, __ERICA EDWARDS__ (chapter advisor), have checked my student's solution and confirm that any use of music/sound is done so with proper permission and is cited correctly in the student's documentation and/or the solution has been found to have no music/sound included.

STUDENT: Answer question 2 below.

2) Does your solution to the competitive event integrate any graphics/videos? [X] YES [ ] NO

   If NO, go to question 3.

   If YES, is(are) the graphics/videos copyrighted, registered and/or trademarked? [ ] YES [X] NO

   If YES, move to question 2A. If NO, move to question 2B.

   2A) Have you asked for author permission to use the graphics and/or videos in your solution and included a permission (letter/form) in your documentation for graphic/video used? If YES, move to question 3. If NO, ask for permission and if permission is granted, include the permission in your documentation.

   2B) Is(are) the graphics/videos royalty free, or did you create your own graphic? If YES, cite the royalty free graphics/videos OR your own original graphics/videos properly in your documentation.

CHAPTER ADVISOR: Sign below regarding your student's answer(s) to the use of graphics/videos in his/her competitive event solution. Even if your student answers "NO" to question 2, please sign below noting that you have evaluated the competitive event solution and the student answered the question(s) accurately.

I, __ERICA EDWARDS__ (chapter advisor), have checked my student's solution and confirm that the use of graphics/videos with proper permission and is cited correctly in the student's documentation and/or the solution has been found to have no graphics/videos included.

STUDENT: Answer question 3 below.

3) Does your solution to the competitive event use another's thoughts or research? [ ] YES [X] NO

   If NO, this is the end of the checklist.

   If YES, have you properly cited other's thoughts or research in your documentation? [ ] YES [ ] NO

   CHAPTER ADVISOR: Sign below regarding your student's answer(s) to having integrated any thoughts/research of others in his/her competitive event solution. Even if your student answers "NO" to question 3, please sign below noting that you have evaluated the competitive event solution and the student answered the question(s) accurately.

   I, __ERICA EDWARDS__ (chapter advisor), have checked my student's solution and confirm that the use of the thoughts/research of others is done so with proper permission and is cited correctly in the student's documentation and/or the solution has been found to have all original thought with no use of other's thoughts/research.

Student Initials: __O. P   A. A__

Chapter Advisor Signature: __Erica N. Edwards__