Modelling Housing Market Fundamentals and the Response to Economic and Political Events: Empirical Evidence from Kuwait

Abstract

Kuwait provides an interesting housing market to examine given its place as a major oil producer, its sensitivity to geo-political events and its unusual demographic characteristics. This paper firstly models the dynamics of the Kuwaiti housing market, using an error-correction framework. The findings highlight that the market is relatively volatile, with evidence of mean-reverting behaviour. The paper also examines the response of the market to seven regional and local events. Of particular interest is that the one event that results in a consistent significant response is domestic legislation directly concerned with housing. This has a far greater impact than local or regional geo-political events.

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1: Introduction

Over the last three decades there has been a large volume of papers to have considered the dynamics of housing markets, and in particular the extent to which prices may deviate from those that can be justified by fundamentals. This especially became a major topic of discussion in many countries during the years prior to and immediately after the 2007-2009 financial crisis. However, the majority of those studies primarily focused upon large and mature markets, markets which are also relatively transparent[1]. Far less research has however been conducted on emerging markets, or on economies whose real estate sector is still maturing. Such markets have quite distinct characteristics that differentiate them from mature economies. These differences arise in a number of respects, but from a real estate perspective one common aspect is that the markets are still primarily development driven due to both the high rate of economic expansion and also the relative lack of existing housing stock. Furthermore, many emerging economies maintain some form of restrictions on the ownership of real estate, with housing in particular often being restricted to citizens. These factors provide such markets with quite different characteristics, and also create additional challenges in modelling them.

In addition to the stage of economic and financial development, emerging markets also often differ in that due to their economic size they may be more impacted by global events. There is a large literature to have considered the degree of financial and economic integration and the contagion impact of events and news[2]. The international integration literature is less prevalent in real estate (e.g. Stevenson et al., 2014), but it is becoming increasingly accepted how the asset is not isolated from global economic conditions or from major national or foreign events, including geo-political and economic instability. This paper examines the Kuwaiti housing market; a market that has received little attention in the housing literature. The paper focuses on both the underlying dynamics of the Kuwait housing market and also adopts a variation of the event study methodological framework commonly adopted in finance and economics, to consider how the residential property market in Kuwait responds to key events. Since the paper is focused on Kuwait, it is necessary to consider recent events in Kuwait and across the broader Middle East and North Africa (MENA).

The remainder of the paper is structured as follows. The next section provides some context to the examination of Kuwait, highlighting some of the relevant features of both the economy and, specifically, the real estate market. Section 3 briefly considers some of the pertinent literature

that has examined the response of real estate markets to major events. Section 4 discusses the data utilized in this study. The empirical analysis is broken into two components and into two sections in the paper. Section 5 considers the modelling of the underlying dynamics of the Kuwaiti housing market, while Section 6 considers the impact of a variety of local and regional events on the market. Section 7 provides concluding comments.

2: Economic and Demographic Background to Kuwait

Kuwait's economic and geographic composition make it of interest in a number of respects, even compared to other emerging markets. Kuwait is a small country with an area of 6,880 square miles. This is only marginally larger than Connecticut, the 48th largest U.S. state which has an area of 5,541 square miles. However, with a population of 4.5 million its population density is high, at 702 per square mile. Kuwait developed historically as a trading port due to its strategic location in the Persian Gulf. However, its economic focus shifted towards petroleum after the discovery of commercially viable crude oil reserves in 1938. Despite its small geographic size, Kuwait is currently the ninth largest producer globally accounting for 3.1% of world production. It also has the fourth largest reserves of oil, 101.5 billion barrels, equating to 6.1% of global reserves. (OPEC, 2019; BP, 2020). The wealth that oil has provided has transformed the Kuwait economy over the last century. It has also provided it with quite distinct characteristics, many of which impact the residential market. For example, while the population resident in Kuwait is 4.2 million, the Public Authority for Civil Information estimated that in 2015 only 1.3 million of the population were Kuwaiti citizens. The ex-patriate/immigrant population has averaged 70% over recent decades. Given the prohibition of foreign property ownership this has consequences for the real estate market in the country. Furthermore, a large proportion of the country is devoted to oil production and in particular the Burgan Field which is the second largest oil field in the world. This contributes to a situation whereby residential areas only account for 11% of the country's land size, with a total of only 170,000 houses (Real Estate Association, 2015). While at first glance it would perhaps be expected that Kuwait shares similarities with similar 'city states' like Hong Kong and Singapore, which have been extensively researched, the demographic structure has an enormous impact upon the house price dynamics in the country.

At the same time, there is considerable domestic demand from Kuwaiti citizens. Between 2000 and 2015 the number of Kuwaiti households increased from 153,587 in 2000 to 266,353 (Real Estate Association, 2015; TPAFCI, 2015). This is not due to a change in factors such as household size, which has largely remained constant. Instead, it has been primarily driven by

natural population growth. Furthermore, in common with many Gulf States, Kuwait has a young population, certainly in comparison to many mature economies such as Japan and many in Europe. Nearly half (48%) of Kuwaiti citizens are younger than 19 years old, and 72% are younger than 35 (Real Estate Association, 2015). This population distribution has major consequences for the housing market in Kuwait[3].

The increased wealth resulting from oil production obviously provides multiple economic and financial benefits to Kuwait. This can be seen through its high, and relatively stable credit ratings, which currently stand at AA (Fitch Ratings), A1 (Moody's) and AA- (Standard & Poor's). However, the impact of having an economy dominated by a single commodity can be problematic, and this can be observed in a number of respects. Oil production accounts for 95% of Kuwait's income and half of its GDP (World Bank, 2014). This obviously means that it is the key economic driver of the country; GDP and other key indicators such as unemployment are strongly related to oil production and oil prices (Coleman, 2013). However, this can leave the country overly exposed, especially to volatility in oil prices and political uncertainty across the Middle East. This is a key component of the analysis contained in the current paper. With respect to oil prices, the impact can be both considerable and felt very quickly. For example, the sharp drop in oil prices between 2013 and 2014, from $100 to less than $50, resulted in Kuwait's first recorded budget deficit since the turn of the century. The deficits observed from 2014 to 2016 prompted the Kuwaiti government to propose *Kuwait Vision 2035*, the country's largest economic development plan since the 1980s. The strategic objectives detailed in the plan are focused on diversifying Kuwait's sources of income, including the development of the country as a regional financial centre. It is intended that the increased stability in income will help in ensuring increased investment in areas such as infrastructure, education, hospitals and housing.

3: Literature Review – Market Response to Events

The finance literature has a long history in examining the response of asset prices to events and announcements that may have an impact upon pricing and other key metrics such as volatility and the bid-ask spread. The event study methodology, as discussed in papers such as McKinlay (1997) and Borusyak & Jaravel (2018), is a widely accepted framework in finance and has also been adopted in a large number of papers to have specifically considered public real estate vehicles such as REITs. This literature has considered a similar broad range of issues including bankruptcies (e.g. Stevenson, 2000b), capital structure and stock issuance (e.g. Howe & Shilling, 1988; Giambona et al., 2005), dividend announcements (e.g. Case et al., 2012),

mergers and acquisitions (e.g. Allen & Sirmans, 1987; McIntosh et al., 1995; Ratcliffe et al., 2018), natural disasters (Sah et al., 2008), political news and information (Schaub, 2020) and regulatory change (e.g. Howe & Jain, 2004). However, in contrast, there is a relatively sparse literature to have examined how housing, or indeed commercial real estate, responds to events. This is primarily because the analysis of responses to asset prices is easier to examine in a capital market context due to the nature of trading, the frequency of the data and the speed at which information is incorporated into prices. The housing literature has instead largely focused on the more fundamental sensitivity of house prices to fundamentals. In addition to the previously cited papers that have modelled the potential deviation of house prices from fundamentals, there is a large literature to have considered the sensitivity of housing to key socio-economic drivers, including GDP and other macro-economic drivers[4]. There is also a long-standing literature that has specifically examined the relationship between housing and inflation, some of which has specifically focused on housing's ability to act as an inflation hedge, while some has considered monetary policy and the broader relationship between the two[5]. Related to those papers, a number of papers have considered the sensitivity of housing markets to interests rates, both in an economic and credit context, and to money supply more generally[6], while a number of papers have specifically considered these issues in the context of the cycle surrounding the 2007-9 financial crisis (e.g. Dokko et al., 2011; Eickmeier & Hoffman, 2013; Taylor, 2007). Mcgibany & Nourzad (2004) and Taylor (2009) both specifically look at the US, finding a negative relationship between interest rates and house prices. While such results make much intuitive sense, they are not always found in the empirical evidence. For example, Shi et al. (2014) report a positive relationship in the New Zealand market from 1999 to 2009. These findings can be explained if one considers the behaviour of other key variables during the same period. Effectively, the positive impact that reduced interest rates would normally have upon house price dynamics was offset during this specific period by factors such as housing supply, regulatory change and the expectations of investors and homeowners. McGibany & Nourzad (2004) also highlight the interaction that can occur and lead to what may appear on first examination to be counter intuitive results. Prime amongst those factors is supply. The importance of supply elasticity is key and papers such as Ball et al. (2010), Caldera & Johansson (2013), Wang et al. (2012) and Yan (2014) have illustrated how it may impact the effect of economic, financial and demographic demand drivers. As Glaeser et al. (2008) notes, the planning/zoning regime in place may also mean that elasticity is not solely influenced by geographic constraints. In turn, papers such as Ball et al. (2010) and Glaeser et al. (2008) argue that housing bubbles are less likely to occur in markets with high supply elasticity, due to the heightened availability of new supply. However, Ihlanfeldt & Mayock (2014) and others suggest that a more ambiguous effect. While higher supply elasticity may result in overbuilding during boom periods, which could produce significant excess

inventory, it may also result in reduced price appreciation during boom periods and therefore minor subsequent corrections. The difference between these two possibilities may be highly related to the timing involved and the market itself. This is consistent with Stevenson & Young (2014) and their analysis of the Irish market. The failure of supply to reach the market in a timely fashion contributed to the price appreciation observed during the pre-2007 boom. However, the increase in supply seen post 2005 may have in turn contributed to the extent of the price declines observed subsequently.

In addition to economic demand drivers, the other major consideration in long-term price fundamentals is centred around the demographic structure of a market. Mankiw & Weil (1989) studied the impact of demographics on US house prices over an extended time-frame, finding that demographics can put both upward and downward pressure on prices. The authors found that a population increase of 1% causes a corresponding increase in house prices of 5%. Bracke (2013), who studied 19 OECD countries from 1970 to 2010, similarly found that population growth is a key driver. The majority of the literature has focused on large markets, relatively few papers have considered smaller countries. One exception is Caldera & Johansson (2013) who examined 21 countries, some of which have a population size that is relatively similar to Kuwait. They find similar results, with Finland the only country not to report a statistically significant relationship between population growth and house prices.

The analysis of Kuwait is of particular interest due to the geo-political events that have affected the country in recent decades. While there has been some examination of similar events, there have been far fewer papers compared to the broad event study literature and this again has primarily focused on the impact in the capital markets. For example, Nikkinen et al. (2008) considered how 53 global financial markets reacted to the September 11, 2001 attacks in the United States, finding quite discernible difference in the responses. At a regional level, all global regions with the exception of MENA (Middle East & North Africa) exhibited a significant fall in returns immediately following the event. However, this was in turn followed by a significant rebound over the next three to six months. A number of papers have assessed the impact of conflicts and revolutionary events on financial markets. Schneider & Troeger (2006) studied the reactions of the American, British and French stock markets to the 1991 Gulf War, the Israeli/Palestinian conflict and to the wars in the former Yugoslavia. The paper reported that while international crises generally resulted in short-term negative impacts in prices, the response to the Gulf War was more conflicted. The authors attributed this discrepancy to the fact that markets have varying sensitivities to political events; hence the deviation in the responses noted across different financial markets. It may also be related to the fact that the Gulf War was both more concentrated in terms of its time span compared to the

conflicts in Israel/Palestine and the former Yugoslavia and also that the supply of a key commodity, i.e. oil, was hugely important in the Gulf conflict.

Mousavi & Ouenniche (2014) studied the impact on financial markets of the revolutionary movements collectively known as the Arab Spring. The markets examined were divided geographically and also into developed and emerging economies. The impact on the prices of oil and gold was also considered. Four different events were examined, namely the revolutions in Egypt, Libya, Tunisia and Yemen. The study found that all of the events significantly impacted market volatility across the six regions and also with respect to Gold and Oil. Choudhry et al. (2018) considered the impact of terrorist attacks across South Asian countries. One aspect that they note is that while all of the countries observe a negative shock on the day of the attack, the most sustained impact is largely felt in those countries more directly affected.

One of the few papers to have examined the real economic impact of geo-political events is Abadie & Gardeazabal (2003) who sought to measure the impact of terrorist activities on the Spanish economy over a three-decade long sample period from the 1960s to the 1990s. They compared the economic impact on the Basque Country with economically comparable areas in Spain that had witnessed no, or significantly reduced, terrorist activity. The authors found that the Basque Country had, on average, a 10% GDP per capita gap than other areas. They also reported that the drop in per capita GDP was associated with the intensity of terrorist activity over the sample period. They concluded that the terrorist activities during the long campaign by ETA resulted in the Basque Country, one of the richest regions in Spain, dropping from having the third-highest per capita GDP in the 1970s to the sixth highest in the 1990s.

A number of papers have considered the political environment in Hong Kong and these are of interest from a number of perspectives. Firstly, Hong Kong's similar geographic size to Kuwait makes it an appropriate comparison. Secondly, one of the papers to have considered Hong Kong did consider the impact on real estate. Chau (1997) considered how political uncertainty during the lead-up to the 1997 handover of Hong Kong to China affected the Hong Kong real estate market. The paper found that the 1984 Joint Declaration, which laid out of the terms of the handover, increase the risk premium of Hong Kong property investment between 1978 and 1994. Interesting, despite the uncertainty concerning what would happen after 1997, which contributed to the emigration of an estimated 500,000 Hong Kong residents, the impact was most evidently felt in the commercial real estate sector. The risk premium in residential real estate exhibited a far smaller increase. The author attributed this to the dual nature of the residential sector, i.e. that it is both an investment and a consumption good. Overall the results supported the premise that despite the uncertainty concerning the handover, investors still retained a high level of confidence in the residential market in Hong Kong.

Chan & Wei (1996) observed another example of differing market reaction to political and economic events in Hong Kong. Historically the Hong Kong stock market could be divided into *Blue-Chip* and *Red-Chip* stocks, the latter being companies controlled by enterprises associated with the People's Republic. Their analysis involved examining news headlines about Sino-British relations that were published on the front page of the *South China Morning Post*, Hong Kong's leading daily newspaper Days in which such headlines were published were considered "events". Although the authors found that both *Blue-Chip* stocks and *Red-Chip* stocks exhibited significant volatility on event days, they found that only *Blue-Chip* stocks were vulnerable to political news. In contrast, *Red-Chip* stocks exhibited no reaction.

4: Kuwaiti Housing Data

The housing data used in this study was collected and aggregated by the authors. The raw data consisted of approximately 60,000 transactions from February 2004 through March 2017 and was collected from the Ministry of Justice's Department of Property Registrations. The data, originally in Arabic, contained information on the property type, transaction date, price and plot size. Some detailed location data was available. However, this was variable in the exactness of the information available. The analysis solely considers single family housing with land and apartments excluded from the final sample. The focus on housing also meant that one part of Kuwait was excluded from the analysis. This was Sabah Alahmad Sea City, a new district/city within Kuwait. It was excluded as the vast majority of the transactions that took place during this period involved land not completed homes. Of 13,496 transactions, only 285 (2.11%) involved single family homes. In addition, a large proportion of houses sold were vacation properties, not primary residences.

The final sample consists of 149,097 properties and 21,762 transactions. In addition to the exclusions mention above the sample was also substantially reduced during the data cleaning process. A large number of transactions had prices logged as zero or at multiple times the average price in the area in question. Questionable data was also observed with respect to plot size. Often the plot size was recorded below the minimum regulated plot in that particular district/city or was unrealistically large given the geographic nature of Kuwait.

The index that was constructed from the underlying data was estimated on a monthly basis. Whilst it would be standard to estimate house price indices using either hedonic or repeat sales methods this was not viable in this case. This was due to the lack of consistent data with respect to property specific characteristics, e.g. size, number of bedrooms etc. In addition, locational

data was variable in its detail. The data restrictions present do highlight one of the challenges in examining emerging housing markets. Alternatives index construction methods therefore had to be considered. The method that was settled upon was the Fisher weighting method. The resulting index has 158 monthly observations. The Fisher (1922) method is the geometric mean of the Laspeyres and Paasche methods and is estimated as follows.

$$\text{Fisher}_{\,t} = [\text{Laspeyres}_t \ * \ \text{Paasche}_{\,t}]^{1/2} \quad (1)$$

The Laspeyres (1871) method measures changes in prices by weighting them according to their transaction volume in the base period and is calculated as follows.

$$\text{Laspeyres}_{\,t} = \frac{\sum(P_{C,t} * Q_{C,0})}{\sum(P_{C,0} * Q_{C,0})} \quad (2)$$

Where *P* and *Q* represent the average price and the quantity, respectively, 0 and *t* the time (base period =0) and (current period = t), and C donates the district. In our case, with the exclusion of Sabah Alahmad Sea City, we have a total of 76 different areas in Kuwait. The important aspect that differentiates the Laspeyres method is that the weighting only utilizes data from the base period. This does simplify the approach as it requires less data (Pink, 2009), but it does obviously mean that any change in the geographic mix of the properties sold is not captured by the index. Rappaport (2007) argues that as a result, price indices constructed using the Laspeyres method can overstate price appreciation.

Unlike Laspeyres, Paasche's (1874) method assigns weights to each period and therefore in our study, changes in transaction volume across the sample are captured:

$$\text{Paasche}_{\,t} = \frac{\sum(P_{C,t} * Q_{C,t})}{\sum(P_{C,0} * Q_{C,t})} \quad (3)$$

The disadvantage to the Paasche method is obviously that far more data is required, in our case transaction volume. The combination of the two methods in the Fisher method results in less extreme movement in the indices (Diewert, 1998; Haan & Diewert, 2011; Hill, 1988). It also moderates the growth rate in comparison to the Laspeyres method (Aizcorbe, 2014).

{Insert Figure 1}

{Insert Figure 2}

Figure 1 displays the calculated house price index. It can be seen that despite the relatively large sample size there are two major outlying observations, in January 2006 and January 2008. The second is to some degree not unexpected. Not only is it in the middle of the financial crisis, but there had also been a significant increase in Oil prices in the preceding months, as illustrated in

Figure 2. Given the importance of oil revenue to Kuwait it is not surprising that this contributed, at least in part, to a surge in demand for housing, resulting in the corresponding spike in prices observed in January 2008. The outliers do though have consequences for the empirical tests contained in Sections 5 and 6, in particular due to the impact on the normality of the data. Jarque-Bera tests on the house price index revealed non-normality at statistically significant levels, a test statistic of 14.65 was estimated. It is detailed in the following sections how the issue of the outliers was addressed in the context of the empirical analysis.

5: Error-Correction Model

The methodological framework adopted to examine the Kuwait market is an error-correction model, as used in papers such as Malpezzi (1999)[7]. The basic long-run inverted demand model is estimated as follows.

$$House\ Prices_t = \alpha + \beta_1 Housing\ Demand_t + \beta_2 Housing\ Supply_t + \beta_3 CPI_t + \beta_4 Interest\ Rates_t + \beta_5 Oil_t + \beta_6 KSE_t + \beta_7 Gold_t + u_t \quad (4)$$

The corresponding Error-Correction specification is thereby defined as.

$$\Delta House\ Prices_t = \alpha + \beta_1 \Delta House\ Prices_{t-1} = \beta_2 \Delta Housing\ Demand_t + \beta_3 \Delta Housing\ Supply_t + \beta_4 \Delta CPI_t + \beta_5 \Delta Interest\ Rates_t + \beta_6 \Delta Oil_t + \beta_7 \Delta KSE_t + \beta_8 \Delta Gold_t + u_{t-1} + \varepsilon_t \quad (5)$$

Where u_{t-1} is the error-correction term[8]. Section 4 detailed the source of the housing data used, and the methodological approached adopted in the estimation of the price indices. The remaining data was sourced as follows. The oil price is used as a proxy for underlying economic demand. As noted in Section 2, oil production accounts for 95% of Kuwait's national income. The availability of high frequency oil price data enables us to model the housing market on a monthly basis. The oil price data was taken as the mean of the spot price for three different forms of Crude Oil: *Brent, West Texas Intermediate* and *Dubai Fateh*. Each is priced in US$ per barrel and the data was sourced from the World Bank. Figure 2 displays the combined price, highlighting the volatility in oil prices over the sample period. This reinforces the challenges that can face a commodity driven country like Kuwait, especially when it is largely dependent upon a single commodity.

The Housing Demand data is based on the number of monthly applicants to the Public Authority of Housing Welfare in Kuwait (PAHWK). As Kuwait is a closed real estate market restricted to Kuwaiti citizens, the PAHWK data is appropriate as there is no need to capture overseas

demand. Furthermore, given the social characteristics in Kuwait, the PAHWK data does largely capture the extent and timing of demand. Kuwaitis tend to live with family until they get married, at which point, if they don't already own a house, they have to right to apply to PAHWK for a house, land and an interest-free loan. The monthly applicants to PAHWK are therefore a strong representation not only of overall housing demand in Kuwait but it should also reflect the demographic makeup of Kuwait.

The Housing Supply data was sourced from what may appear to be an unusual source. However, it allowed us to obtain monthly data. The data used was the number of new houses supplied with electricity from the Ministry of Electricity. This data was felt to not only have the benefit of a monthly frequency, but it was also felt that it would more accurately capture the timing of properties as they come onto the market and near completion. Both CPI (Consumer Price Index) and interest rate data was obtained from the Central Bank of Kuwait. The price of Gold was sourced from the World Gold Council. The final variable represents the Kuwait Stock Exchange (KSE) and was proxied by the Kuwait All Stocks Index.

As noted in the previous section, there were noticeable outliers in the House Price Index in January 2006 and January 2008. In order to address this without excluding the observations we adopt the standard econometric approach of including dummy variables into the specifications detailed in Equations (4) and (5) for the outlying months[9]. Table 1 reports the estimations from the long-run model. The results are largely in line with expectations. Firstly, the two dummy variables display statistically significant positive coefficients which helps to justify the use of them. Significant positive coefficients are also reported with respect to Housing Demand, CPI and Oil Prices, while significantly negative coefficients are observed in the case of Housing Supply. The more interesting results are with respect to Interest Rates, Stock Prices and Gold. All three variables report significant coefficients, Interest Rates positive and negative coefficients for Stocks and Gold. These do warrant some further consideration.

{Insert Table 1}

One would normally expect a negative sign with respect to interest rates. The finding of a statically significant positive coefficient in this case may be due to the nature of the Kuwaiti market. Specifically, the following factors must be taken into in the case of Kuwait: Firstly, the high pressure of housing demand may reduce the influence of other variables or make them insignificant. Secondly, the housing supply shortage and complicated planning system can increase demand pressure on housing. Thirdly, mortgage constraints on individuals can significantly reduce the importance of interest rates. The maximum loan that any Kuwaiti can

take is K.D. 70,000, equivalent to approximately $230,000. If a family has a large enough down payment to buy a house then their decision to purchase may not be affected by interest rate changes. On the other hand, if a family cannot afford to buy a house because of its price, reducing interest rates may not dramatically alter the situation. Fourth, assuming that interest rates are less important on the demand side, it is possible that interest rates may be more influential with regard to supply and the cost of construction. In simple terms, higher interest rates affect developers by increasing the premium on house prices. Interest rates may also be reflecting more the timing of their movement with respect to the economic cycle, i.e. that rates often rise when economic conditions are especially robust. Given the above it would therefore make some sense that a positive relationship is noted here.

Stocks are seen to have a negative coefficient, as is Gold. We included these two variables in order to consider the impact of local investors and to determine whether they consider the housing market to be a viable and attractive alternative investment opportunity. The reported negative coefficients would imply that investors do switch between investing in stocks/gold and real estate, based on the relative performances of these markets. Other factors that may also come into play include the perception that Gold is a safe haven. It therefore may see increased investment at times of heightened uncertainty. Also, with stocks, the more immediate incorporation of information into stock prices means that stocks tend to respond more rapidly to news and events. This fact has been well documented in the real estate portfolio literature with respect to the low correlation reported between stocks and real estate and the resulting diversification benefits observed.

{Insert Table 2}

Table 2 presents the findings from the Error-Correction model. The results highlight several issues. First, while most exhibit the anticipated sign, none of the variables are statistically significant with the exception of the lagged house price variables. It is of interest that these are also significantly negative, not positive. This would imply a degree of mean reverting behaviour. This is somewhat unusual in a housing context where high autocorrelation and myopic and extrapolative expectations are more commonly observed (Malpezzi & Watcher, 2005). It may be the case that the relatively high volatility observed in the Kuwaiti housing market, which in itself may be reflecting the unique characteristics of the market, for example the strong influence of a volatile commodity (oil), could be contributing to the findings here. This proposition is, to some extent, supported by the findings from the error-correction term itself and the dummy variables for 2006 and 2008, all of which are statistically significant and

of the anticipated sign, i.e. the coefficient for error-correction term is negative, while those for the dummy variables reflex the spike in prices and the subsequent correction.

In order to further examine these issues we re-estimate the models over rolling periods. This is one of the benefits of using, relatively, high frequency data. The analysis is conducted over ten-year periods; 2004-14, 2005-15, 2006-16 and 2007-17. The results from these estimations are reported in Table 3 (long-run model) and Table 4 (ECM). Table 3 shows that most of the variables have a consistent relationship with house prices. Housing demand, housing starts, interest rates and gold prices all exhibit similar relationships with housing prices as those found for the ECM with the full sample. Inflation and oil prices also exhibit similar and consistent findings across all sub-samples except the last one, in which inflation and oil prices were found to have a negative relationship with house prices. This last finding is possibly a result of the volatility of oil prices and the drop in house prices from 2014 until the end of the sample. Finally, the Kuwait Stock Exchange was found to have a negative relationship with housing in the first sub-sample and a positive relationship in the remaining periods.

{Insert Table 3}

{Insert Table 4}

The rolling error-correction results, in Table 4, offer some interesting findings. Unlike the results over the full sample, the sub-sample findings illustrate the significant influence of the explanatory variables on housing prices. Housing Demand and Supply, together with Interest Rates, all have a significant influence on prices in three of the four sub-samples. Interestingly, even with the period rollover, the coefficients of these three variables did not substantially change. Gold prices exhibited a continuous negative relationship with housing prices; however, this relationship was significant in only one of the four periods. Like the full sample model, and contrary to initial expectations, the first two sub-samples showed that the HPI at lag one had a significant negative relationship with the HPI at level, again supporting the premise of mean-reverting behaviour.

{Insert Table 5}

{Insert Table 6}

{Insert Figure 3}

The final variation addresses the issue of short-term volatility. A number of the results discussed so far have highlighted that the house price series does display quite significant volatility. To consider this we smooth the house price index using moving averages of 3, 6 and 12 months, as shown in Figure 3. The 3-month moving average (3MA) starts in April 2004 and has 156 observations, the 6-month moving average (6MA) starts in July 2004 and has 153 observations and the 12-month moving average (12MA) starts in January 2005 and has 147 observations. Tables 5 and 6 respectively report the findings from the re-estimated long-term and error-correction models using the smoothed series. The long-term model shows findings consistent with those previously discussed models. The only unexpected finding is the negative relationship between oil prices and house prices in the 12MA model. The findings from all of the ECMs, as reported in Table 6, also support the previous findings. Focusing only on significant coefficients, housing demand, housing starts and interest rates exhibit relationships with housing prices similar to those found in the previous specifications. Since the main concern in the previous models is the influence of volatility, which produces a negative relationship between housing at lag one, it is interesting to see that across the three moving average periods, a significant positive coefficient is reported. This would confirm the assentation's previously made concerning the heightened volatility and mean reverting behaviour of the raw underlying series. Gold prices exhibit a continuous negative relationship with housing; however, this relationships is only statistically significant with the 12MA series. The correction speed was very slow compared to those found in previous specifications. Specifically, in the 3MA and 6MA estimations the correction speed is 5% monthly, while in the 12MA model, it is only 2% monthly. Both this finding and the small coefficient numbers are affected by the smoothing process.

6: Market Response to Geo-Political Events

The second phase of the empirical analysis considers the response of the Kuwait housing market to a variety of both regional and local events. As noted earlier, given the geographic location of Kuwait in the Gulf, especially with it bordering Iraq, it means that the country is highly vulnerable to geo-political risk. Furthermore, on a more general basis, as an emerging market the importance of domestic political, legislative and economic events will also be potentially of great importance. Finally, and as noted in the introduction, the small geographic size of Kuwait means that the impact is potentially heightened and may also be incorporated into asset prices more rapidly.

The dynamics of a housing market is, like all real estate and land markets, not as easy to analyse compared to many assets. Its heterogeneity, the data issues that commonly arise and its privately traded nature all contribute to challenges in effectively designing an event study framework to apply in the context of real estate. Furthermore, in common with all event studies it is essential that the influence of fundamentals and other events on the dependent variable are controlled for. Again, this is somewhat more challenging than when considering assets like stocks. Due to the nature of housing markets, and the data we have available, we approach this by incorporating dummy variables into our econometric specifics (Karafiath, 1988; Borusyak & Jaravel, 2018)[10]. This approach was taken rather than consider abnormal returns over an event window due to the two main reasons. In comparison to assets like stocks the assessment of the expected return is not a simple. In stocks simple asset pricing frameworks can be used to relatively accurately obtain an estimate of the 'normal' return. This is not as easy to do with housing data. Secondly, again in contrast with financial markets, the appropriate choice of event window is more debatable. Whereas you may assume that the prices of financial assets, such as stocks, would respond to new information relatively rapidly, that cannot be assumed with housing. Its nature as an illiquid and privately traded asset mean that information may take a significant period of time to be reflected in prices. It is commonly accepted that often the first indicator of a weaker housing market is not an adjustment to prices but an extension to marketing periods and a reduction in volume. Similarly, the slow incorporation of information on appraisals in the commercial market has been well observed since the seminal work of authors such as Blundell & Ward (1987), Fisher et al. (1994) and Geltner (1991, 1993). Given the challenges that arise in a real estate context we use eight alternative dummy variables for each event. The first four dummy variables start during the same month as the event. Where they differ is with respects to the horizon. One dummy captures 3 months, one 6 months, one lasts for 12 months and one is assumed to have a permanent impact. The second four dummy variables start three months after the event, and have the same impact period durations as the first four dummies. By using this approach we broaden the analysis and thereby reduce the risk of missing any significant responses in the housing sector.

As noted above, the other major challenge with housing compared to stocks is that it is harder to control for other influences in order to obtain an estimate of the abnormal return. We cannot simply utilise an asset pricing model to estimate the expected return. Given this challenge we utilize the error-correction models from the previous section. This thereby incorporates key supply and demand drivers into the framework. We achieve this by adding the dummy variables into the ECM specification. For robustness purposes we also analyse the impact of the events using a non-parametric approach. This compares the standard deviation, appreciation rate and

transaction volume of the house price index before and after the event. We examine this using both three and six month windows, before and after the event in question.

6.1: Regional Events

Three different regional events were selected that we believed were most likely to impact the Kuwait housing market, the Kuwait economy and consumer confidence. The first event is the death of King Fahad Alsaoud, the king of Saudi Arabia until August 2005. This event was considered because of the close relationship between Kuwait and Saudi Arabia and due to Saudi Arabia being one of wealthiest countries in the region. Therefore, changes in the Saudi Arabian leadership have the potential to wield considerable influence on smaller neighbouring countries such as Kuwait. The succession of King Abdullah, King Fahad's brother, may have had positive or negative impacts on the market, depending on expectations. The results in Table 7 reveal no evidence that the market reacted to the change in the Saudi Arabian leadership. Furthermore, even without considering the significance level of the results, the signs were inconsistent, confirming that what happened in Saudi Arabia had a marginal impact on the Kuwait housing market. Non-parametric testing was not possible in this case due to it occurring so close to the start of the sample.

{Insert Table 7}

The second event was the execution in January 2007 of Saddam Hussein, the former president of Iraq. This was an obvious event to include for a number of reasons. Firstly, the invasion of Kuwait in 1990 by Iraq. However, even after the liberation of Kuwait in 1991 there was continued tension between Iraq and Kuwait, culminating in the 2003 invasion of Iraq by US led forces and the subsequent overthrow of the Ba'ath Party regime. The availability of housing data from 2004 onwards meant that his execution had to be used rather than the invasion and regime change in 2003. The regression results again revealed no significant response in the Kuwaiti housing market. However, the non-parametric tests did reveal large differences in standard deviation, price growth and transaction volume over the 12 months before and after the event.

The last regional event considered was the Arab Spring. Starting in Tunisia in December 2010, the Arab Spring spread across several countries in the region, producing varying levels of activism and demonstrations in each. Kuwait was one of the few countries in the region that

was not directly affected. In part this was due to Kuwait's strong judiciary and it being one of the few countries in the Middle East and North Africa to have universal suffrage for those Kuwaiti citizens aged 21 and older. Direct voting to the National Assembly was first introduced in 1985 and women obtained the vote, on an equal basis to men, in 2005. The National Assembly in Kuwait does not only have to approve the Emir's nomination for Prime Minister but they have the power to remove the Emir himself. Furthermore, Kuwait does not restrict demonstrations. We tested the response of the Arab Spring due to its large regional impact and the geo-political uncertainty it created. However, no significant results were reported with either the ECM or non-parametric tests.

6.2: Local Events

In addition to the three regional events we also considered the impact of four events that were local to Kuwait. The results from these tests are presented in Table 8. The events considered were not only more geographically focused but also varied in terms of their nature. Whereas the regional events were primarily political in nature, the local events are more mixed and include some specific to housing.

The first local event considered is the death in January 2006 of former Emir Shaikh Jaber Alsabah. As in the case of the death of King Fahad, we expected that the market may have positive or negative reactions to this event, depending on people's expectations concerning the new Emir. This was especially so in this case as Shaikh Jaber Alsabah had been a popular incumbent. We found that this event had two significant but temporary positive impacts on the housing market: one that started the month of the event and lasted for six months and one that started three months after the event and lasted for three months. These impacts likely reflect the market regaining its confidence due to the smooth transition in power with the new Emir approved with the unanimous support of the Kuwait General Assembly. The non-parametric tests showed that house prices dropped slightly after the event. The transaction volume was similar before and after the event.

{Insert Table 8}

The second local event was the introduction of two new laws specifically related to the housing sector. Law 8-2008 forbid companies from buying any houses or residential lands, while law 9-2008 required any individual owning more than 5,000 square metres of undeveloped lands to pay a tax of K.D. 1 per each additional square meter per annum. Both of these laws took effect

in February 2008 and so can be examined jointly. The introduction of the new laws is the event with the clearest direct impact on housing and perhaps therefore not surprisingly we find that the market exhibited a significant negative reaction during the first 3 and 12 months after the event. When we assume that the impact did not start until three months after the introduction of the laws, we found that the event negatively affected the housing market over the 6 and 12 month periods, but did not have a permanent impact. We also find that the transaction volume decreased by half during the 12 months after the event, compared with the same period of time the previous year. Furthermore, for 12 months after the event the house price index fell, in comparison to 25% positive growth in the same period the year prior. Although the negative impact of the introduced laws is clear, it is difficult to tell which of the two laws (if either) had the most influence on the shift in the market.

The third event, in December 2011, centres on the first replacement of a Kuwait Prime Minister. The replacement of Shaikh Naser Alsabah occurred in response to a number of demonstrations calling on the Emir to replace him. Although all coefficients for these event had positive signs, none were statistically significant. Furthermore, housing, in terms of both prices and transaction volume, were similar before and after the event. It therefore appears that the market had no reaction to this event. This may indicate that the market had a high level of confidence in the system.

The final local event was a terrorist attack in July 2015. Not only was it the first terrorist attack in three decades but the suicide bomber detonated the device in a Mosque during the Joma'a prayer. The combination of the rarity of the event and the location of the attack had a major impact in Kuwait. Although most of the coefficients display a negative response in most cases they aren't significant. The exception is when one considers the horizon starting three months after the event and lasting permanently, or at least until the end of the sample in March 2017. There is no evidence that the terrorist attack reduced transaction volume; although house price growth for the same period the year before was positive and turned negative after the event. Overall, the Kuwait housing market seems to be largely insensitive to local and regional political events. This could be due to the constraints on housing demand or a high level of confidence in the country's system. However, changes in housing legislations clearly affected the Kuwait housing market across four different periods. The market also exhibited a negative response to a terrorist attack within the country, perhaps due to a loss of confidence in the market.

6: Concluding Comments

Studying housing sectors in emerging markets is challenging, especially in cases with data limitations and often relatively short periods of study. The results do highlight some of the unique features that can differentiate emerging markets from more mature sectors, which have been the focus of the vast majority of the housing literature. Kuwait is an interesting case study due to its potential vulnerability to geo-political risk and also its dependency upon oil as its primary source of revenue. The analysis does highlight that the market is relatively volatile, perhaps reflecting some of the increased uncertainty that can arise from those risk factors. In addition, the fact that Kuwait is still a largely development driven real estate market, and with limitations place on ownership, can also add to that. It is though interesting that despite these features Kuwait, in many respects, shares the same characteristics of more mature housing markets. This is especially noticeable in the event study analysis. The one event that sees consistent significant response isn't related to geo-political risk but rather domestic legislation that directly impacts upon the housing market. Despite the noticeable differences that can be observed, such 'mundane' events have a far greater impact than more visible risk factors.

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Tables & Figures

Figure 1: House Price Index

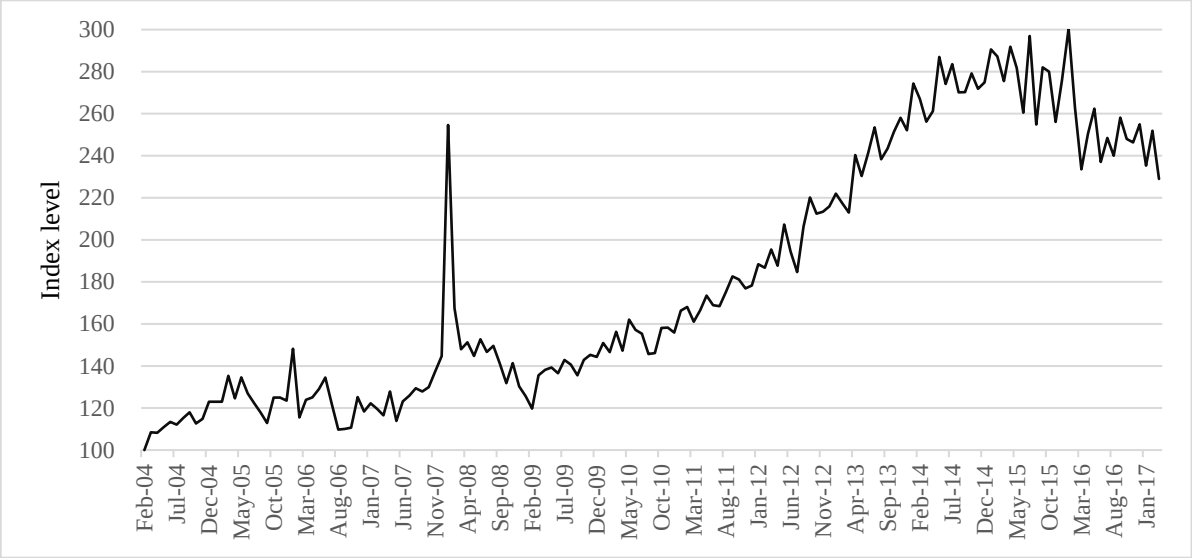
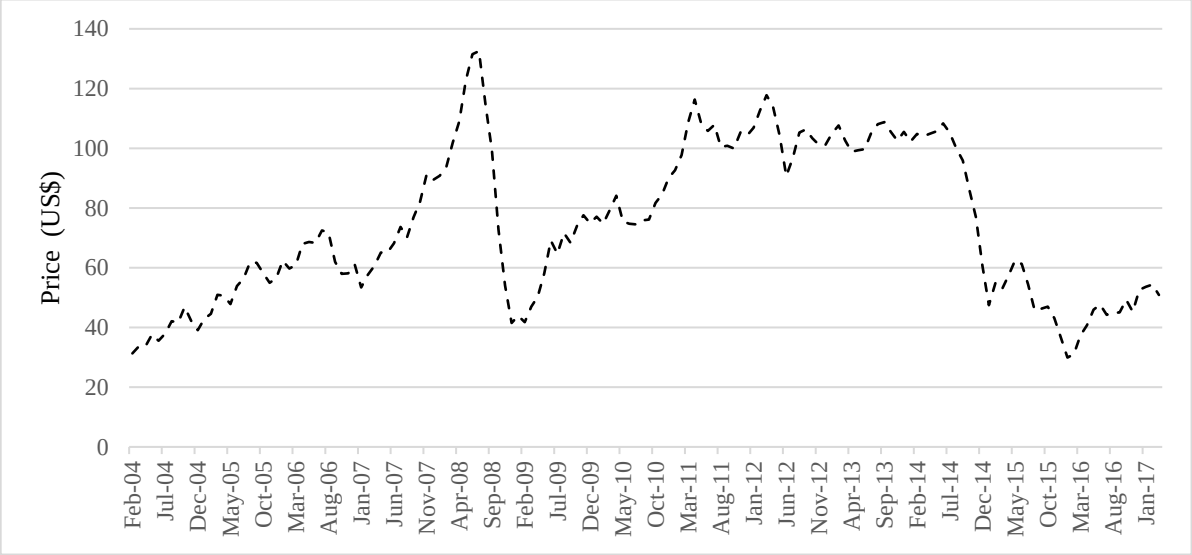


Figure 2: Combined Oil Price



Notes: Figure 2 displays the combined oil price as calculated by the authors. It is estimated as the mean of the US Dollar price per barrel for Brent, West Texas and Dubai Fateh.

Table 1: Long-Term Inverted Demand Model

	Coefficient	Standard Error	T-Statistic
Intercept	3.8770	1.7879	2.1685**
Housing Demand	1.0268	0.1900	5.4038***
Housing Starts	-1.0018	0.1796	-5.5784***
Consumer Price Index	1.3408	0.4476	2.9955***
Interest Rates	0.0353	0.0142	2.4812**
Oil Price	0.2996	0.0445	6.7375***
Stock Prices (Kuwait)	-0.2261	0.0622	-3.6334***
Gold Price	-0.7019	0.0679	-10.3432***
Dummy Jan 2006	0.3327	0.0891	3.7338***
Dummy Jan 2008	0.6486	0.0894	7.2566***
R-Squared adj.	0.9274	No. of Observations	158
F-Statistic	223.9527***		

Notes: *** indicate significance at 1%

Table 2: Error-Correction Model

	Coefficient	Standard Error	T-Statistic
Intercept	0.0016	0.0066	0.2476
House Prices Lag 1	-0.3213	0.0793	-4.0496***
House Prices Lag 2	-0.1057	0.0635	-1.6631*
Housing Demand	0.6461	0.4630	1.3956
Housing Starts	-0.5909	0.4438	-1.3314
Consumer Price Index	0.1563	0.8738	0.1788
Interest Rates	0.0237	0.0210	1.1291
Oil Price	-0.0008	0.0535	-0.0141
Stock Prices (Kuwait)	0.0810	0.0850	0.9535
Gold Price	-0.1021	0.1130	-0.9033
Error-Correction Term	-0.1500	0.0586	-2.5596**
Dummy Jan 2006	0.2007	0.0546	3.6776***
Dummy Feb 2006	-0.2076	0.0551	-3.7665***
Dummy Jan 2008	0.5960	0.0571	10.4429***
Dummy Feb 2008	-0.2456	0.0695	-3.5360***
Dummy March 2008	-0.1751	0.0701	-2.4987**
R-Squared adj.	0.6143	No. of Observations	155
F-Statistic	17.3484***		

Notes: *** indicate significance at 1%

Table 3: Rolling Long-Term Model

	Feb 2004-March 2014		Feb 2005-March 2015		Feb 2006-March 2016		Feb 2007-March 2017	
	Coefficient	**P-Value**	**Coefficient**	**P-Value**	**Coefficient**	**P-Value**	**Coefficient**	**P-Value**
Intercept	0.4166	0.8449	4.5358	0.0314	9.4890	0.0000	10.7382	0.0000
Housing Demand	0.5207	0.0132	1.6812	0.0000	2.2255	0.0000	2.5144	0.0000
Housing Starts	-0.5276	0.0074	-2.2583	0.0000	-3.0846	0.0000	-2.5790	0.0000
Consumer Price Index	2.2935	0.0002	1.5120	0.0068	0.8995	0.1172	-1.5381	0.0198
Interest Rates	0.0449	0.0003	0.0559	0.0000	0.0462	0.0000	0.04.65	0.0000
Oil Price	0.4194	0.0000	0.0549	0.3372	0.0082	0.8850	-0.0318	0.5003
Stock Prices (Kuwait)	-0.3163	0.0000	0.0322	0.6977	0.0480	0.5438	0.1620	0.0257
Gold Price	-0.7076	0.0000	-0.2728	0.0050	-0.2040	0.0360	-0.0980	0.2457
Dummy Jan 2006	0.3047	0.0005	0.2861	0.0002				
Dummy Jan 2008	0.6287	0.0000			0.6717	0.0000	0.6926	0.0000
Dummy Feb 2008			0.6299	0.0000	0.2294	0.0008	0.2433	0.0001
R-Squared adj	0.9018		0.9432		0.9603		0.9643	

Notes: *** indicate significance at 1%

Table 4: Rolling Error-Correction Model

	Feb 2004-March 2014		Feb 2005-March 2015		Feb 2006-March 2016		Feb 2007-March 2017	
	Coefficient	**P-Value**	**Coefficient**	**P-Value**	**Coefficient**	**P-Value**	**Coefficient**	**P-Value**
Intercept	0.0048	0.4998	0.0032	0.7199	-0.0003	0.9718	-0.0001	0.9951
House Prices Lag 1	-0.235	0.0066	-0.1883	0.0284	0.0168	0.8258		
Housing Demand	0.5766	0.19	1.3341	0.0331	1.7207	0.0179	1.7766	0.0277
Housing Starts	-0.5689	0.1855	-1.5397	0.0058	-1.8906	0.0167	-1.6001	0.0258
Consumer Price Index	0.1728	0.8432	-0.0631	0.9416	-0.7443	0.4686	-1.6079	0.1309
Interest Rates	0.0235	0.0024	0.0522	0.0002	0.0511	0.0004	0.0435	0.0007
Oil Price	0.0502	0.4359	0.0064	0.9132	-0.0049	0.9421	-0.0093	0.8836
Stock Prices (Kuwait)	0.0763	0.3741	0.1168	0.1704	0.0453	0.6619	0.0545	0.5891
Gold Price	-0.1454	0.2206	-0.0544	0.6293	-0.1735	0.1804	-0.2158	0.0925
Error-Correction Term	-0.1465	0.0322	-0.2801	0.0004	-0.4346	0.0000	-0.549	0.0000
Dummy Jan 2006	0.1949	0.0002	0.1987	0.0001				
Dummy Feb 2006	-0.22	0.0000	-0.239	0.0000				
Dummy Jan 2008	0.585	0.0000	0.5965	0.0000	0.6386	0.0000	0.6653	0.0000
Dummy Feb 2008	-0.3016	0.0000	-0.3381	0.0000	-0.441	0.0000	-0.4291	0.0000
Dummy March 2008	-0.2052	0.0027	-0.1744	0.0084				
R-Squared adj	0.7257		0.7469		0.6487		0.6748	

Notes: *** indicate significance at 1%

Figure 3: Smoothed House Price Series'

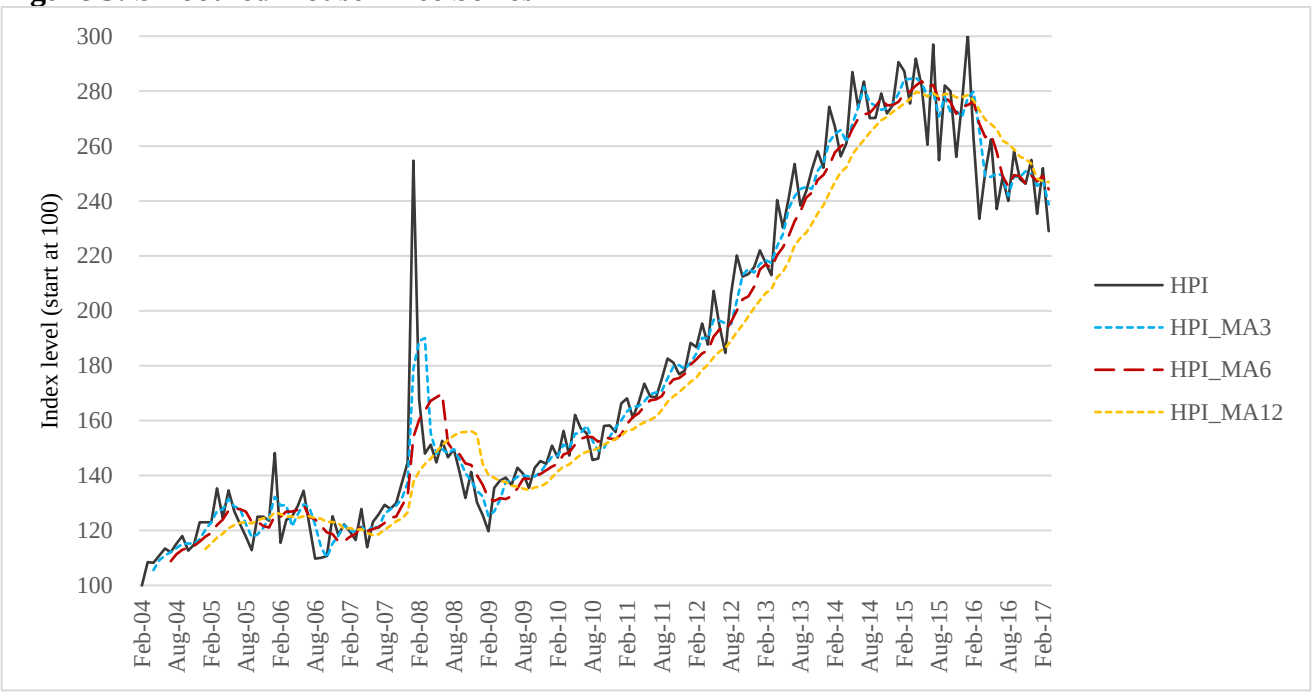


Table 5: Long-Term Model Smoothed HPI

	3 Month Moving Average		6 Month Moving Average		12 Month Moving Average	
	Coefficient	**P-Value**	**Coefficient**	**P-Value**	**Coefficient**	**P-Value**
Intercept	3.8104	0.0076	-0.4989	0.7166	0.4849	0.6314
Housing Demand	1.2791	0.0000	1.0299	0.0000	1.3313	0.0000
Housing Starts	-1.3291	0.0000	-1.2077	0.0000	-1.8518	0.0000
Consumer Price Index	0.9045	0.0096	1.7253	0.0000	1.8236	0.0000
Interest Rates	0.0448	0.0000	0.0480	0.0000	0.0428	0.0000
Oil Price	0.1843	0.0000	0.1244	0.0015	-0.0675	0.0253
Stock Prices (Kuwait)	-0.0365	0.4961	0.1102	0.0523	0.2479	0.0000
Gold Price	-0.4941	0.0000	-0.3594	0.0000	-0.1478	0.0036
Dummy Jan 2005					-0.2448	0.0000
Dummy Feb 2005					-0.1862	0.0003
Dummy Jan 2008	0.2912	0.0000				
Dummy Feb 2008	0.3276	0.0000				
Dummy March 2008	0.2772	0.0001				
Dummy Feb 2017					-0.1219	0.0066
Dummy March 2017	-0.1686	0.0133			-0.1364	0.0025
R-Squared adj	0.9589		0.9566		0.9812	
Observations	156		153		147	

Table 6: Error-Correction Model Smoothed HPI

	3 Month Moving Average		6 Month Moving Average		12 Month Moving Average	
	Coefficient	**P-Value**	**Coefficient**	**P-Value**	**Coefficient**	**P-Value**
Intercept	0.0036	0.1373	0.0024	0.1173	0.0004	0.6233
Housing Prices (lag1)	0.2879	0.0000	0.4946	0.0000	0.6978	0.0000
Housing Demand	0.1198	0.4684	0.1308	0.2386	0.1704	0.0075
Housing Starts	-0.1419	0.3863	-0.1355	0.1763	-0.1852	0.0021
Consumer Price Index	-0.0900	0.7820	0.0231	0.8986	0.1201	0.2147
Interest Rates	0.0130	0.0009	0.0070	0.0014	0.0057	0.0002
Oil Price	-0.0061	0.7496	0.0152	0.1767	0.0021	0.7173
Stock Prices (Kuwait)	0.0615	0.0420	0.0157	0.3716	-0.0006	0.9500
Gold Price	-0.0365	0.3615	-0.0432	0.0638	-0.0210	0.0832
Error-Correction Term	-0.0493	0.0539	-0.0466	0.0032	-0.0228	0.0611
Dummy Dec 2007	0.0795	0.0001	0.0803	0.0000		
Dummy Jan 2008	0.1579	0.0000			0.0372	0.0000
Dummy April 2008	-0.1571	0.0000				
Dummy July 2008			-0.0857	0.0000		
Dummy Jan 2009					-0.0348	0.0000
Dummy March 2017	-0.0918	0.0000	-0.0498	0.0000		
R-Squared adj	0.6235		0.6615		0.8037	
Observations	154		151		145	

Table 7: Regional Events

	Event Period			Post Event			Same Period Prior Year		
	Start (from event date)	End (after start)	Significance	HPI St.Dev	HPI Growth	Transaction Volume	HPI St.Dev	HPI Growth	Transaction Volume
Death of King Fahad August-2005	Same day	3 months	-0.023383	N/A	N/A	N/A	N/A	N/A	N/A
	Same day	6 months	-0.009427	N/A	N/A	N/A	N/A	N/A	N/A
	Same day	12 months	0.007989	N/A	N/A	N/A	N/A	N/A	N/A
	Same day	Permanent	-0.018136	N/A	N/A	N/A	N/A	N/A	N/A
	After 3 months	3 months	0.012522	N/A	N/A	N/A	N/A	N/A	N/A
	After 3 months	6 months	0.01668	N/A	N/A	N/A	N/A	N/A	N/A
	After 3 months	12 months	-0.01401	N/A	N/A	N/A	N/A	N/A	N/A
	After 3 months	Permanent	-0.004252	N/A	N/A	N/A	N/A	N/A	N/A
Saddam Husain execution January-2007	Same day	3 months	-0.01372	N/A	0.74%	871	N/A	-0.14%	640
	Same day	6 months	-0.017822	N/A	2.68%	1,892	N/A	0.03%	1,310
	Same day	12 months	-0.003469	7.1304	17.72%	4,508	0.3774	-0.62%	2,696
	Same day	Permanent	-0.00188	N/A	N/A	N/A	N/A	N/A	N/A
	After 3 months	3 months	-0.021156	N/A	1.14%	1,021	N/A	-0.06%	669
	After 3 months	6 months	-0.00204	N/A	7.29%	2,272	N/A	-0.12%	1,330
	After 3 months	12 months	0.008853	12.8234	29.09%	4,952	0.4138	0.05%	2,926
	After 3 months	Permanent	0.001328	N/A	N/A	N/A	N/A	N/A	N/A
Arab Spring December-2010	Same day	3 months	0.014675	N/A	2.24%	839	N/A	2.04%	716
	Same day	6 months	0.006749	N/A	3.72%	1,706	N/A	6.68%	1,512
	Same day	12 months	0.004742	5.1443	10.18%	3,575	5.8244	11.79%	3,208
	Same day	Permanent	0.016213	N/A	N/A	N/A	N/A	N/A	N/A
	After 3 months	3 months	-0.002177	N/A	1.00%	867	N/A	3.06%	796
	After 3 months	6 months	-0.00602	N/A	4.24%	1,789	N/A	5.84%	1,635
	After 3 months	12 months	0.005679	5.5116	9.40%	3,718	5.1490	11.75%	3,331
	After 3 months	Permanent	0.014791	N/A	N/A	N/A	N/A	N/A	N/A

Table 8: Local Events

	Event Period				Post Event		Same Period Prior Year		
	Start (from event date)	**End (after start)**	**Significance**	**HPI St.Dev**	**HPI Growth**	**Transaction Volume**	**HPI St.Dev**	**HPI Growth**	**Transaction Volume**
Death of President Jaber Alsabah January-2006	Same day	3 months	0.009991	N/A	-0.14%	640	N/A	2.94%	668
	Same day	6 months	**0.05746*** **	N/A	0.03%	1,310	N/A	6.19%	1,297
	Same day	12 months	-0.00625	0.3774	-0.62%	2,696	2.8030	7.71%	2,531
	Same day	Permanent	-0.007102	N/A	N/A	N/A	N/A	N/A	N/A
	After 3 months	3 months	**0.070518*** **	N/A	-0.06%	669	N/A	2.29%	628
	After 3 months	6 months	-0.021264	N/A	-0.12%	1,330	N/A	2.24%	1,237
	After 3 months	12 months	-0.010139	0.4138	0.05%	2,926	1.6618	4.56%	2,503
	After 3 months	Permanent	-0.007713	N/A	N/A	N/A	N/A	N/A	N/A
Introducing new housing law February-2008	Same day	3 months	**-0.118076*** **	N/A	2.75%	1,268	N/A	1.32%	908
	Same day	6 months	-0.043597	N/A	5.77%	2,276	N/A	4.07%	2,014
	Same day	12 months	**-0.063062*** **	4.2526	-1.53%	3,577	9.4140	24.93%	4,677
	Same day	Permanent	-0.003175	N/A	N/A	N/A	N/A	N/A	N/A
	After 3 months	3 months	-0.023826	N/A	1.50%	1,008	N/A	2.32%	1,106
	After 3 months	6 months	**-0.05077*** **	N/A	2.07%	1,768	N/A	9.38%	2,411
	After 3 months	12 months	**-0.035966*** **	8.3337	-11.11%	2,750	13.7134	30.11%	5,037
	After 3 months	Permanent	0.000604	N/A	N/A	N/A	N/A	N/A	N/A
Prime Minister replacement December-2011	Same day	3 months	0.018334	N/A	0.93%	982	N/A	2.24%	839
	Same day	6 months	0.027278	N/A	4.23%	2,021	N/A	3.72%	1,706
	Same day	12 months	0.024675	6.6923	11.46%	3,985	5.1443	10.18%	3,575
	Same day	Permanent	0.01579	N/A	N/A	N/A	N/A	N/A	N/A
	After 3 months	3 months	0.034658	N/A	2.06%	1,039	N/A	1.00%	867
	After 3 months	6 months	0.016882	N/A	4.97%	2,034	N/A	4.24%	1,789
	After 3 months	12 months	0.026426	8.2288	14.00%	3,926	5.5116	9.40%	3,718
	After 3 months	Permanent	0.013361	N/A	N/A	N/A	N/A	N/A	N/A
Alsaddeq Terrorist attack July -2015	Same day	3 months	0.012477	N/A	-0.45%	682	N/A	1.70%	754
	Same day	6 months	0.003787	N/A	-1.45%	1,320	N/A	3.49%	1,475
	Same day	12 months	-0.01149	3.9398	-4.33%	2,487	4.2518	3.96%	2,902
	Same day	Permanent	-0.019312	N/A	N/A	N/A	N/A	N/A	N/A
	After 3 months	3 months	-0.004999	N/A	-0.85%	638	N/A	1.12%	721
	After 3 months	6 months	-0.024623	N/A	-1.68%	1,237	N/A	2.01%	1,447
	After 3 months	12 months	-0.012989	6.2941	-6.71%	2,398	2.0472	1.53%	2,830
	After 3 months	Permanent	**-0.024275*** **	N/A	N/A	N/A	N/A	N/A	N/A

Endnotes

[1] A 'small' number of examples of those studies include; Angello & Schuknect (2011), Ascheberg et al. (2014), Black et al. (2006), Bourassa et al. (2019), Brzezicka et al. (2018), Case & Shiller (2003), Coleman et al. (2008), Escobari et al. (2015), Fabozzi & Xiao (2019), Glaeser et al. (2017), Himmelberg (2005), Hott & Monnin (2008), Hui & Yue (2006), Ihlanfeldt & Mayock (2014), Ikromov & Yavas (2012), Kim & Suh (1993), Lai & Van Order (2017), Martins et al. (2020), Park et al. (2010), Peláez (2012), Roche (2001), Stevenson (2008), Tsai (2015) and Wheaton & Nechayev (2008).

[2] See for example, Bekaert et al. (2001, 2006, 2014), Heathcote & Perri (2004), Perri & Quadrini (2018) and Kose et al. (2003, 2012).

[3] Stevenson (2008) highlighted, in the context of Ireland, how demographics shifts can have a significant impact in the case of small countries.

[4] See Adam & Fuss (2010), Belej & Cellmer (2014), Iacovello & Minetti (2003), Kasparova & White (2001), Lee & Song (2015) and Worthington (2012).

[5] e.g. Case & Shiller (1990), Fama & Schwert (1977), Kuang & Liu (2015) and Stevenson (2000a).

[6] e.g. Adam & Fuss (2010), Aoki et al. (2004), Choudry (2010), Elbourne (2008), Goodhart & Hoffman (2008), Gupta & Kabundi (2010), Iacoviello & Minetti (2008), Iacoviello & Neri (2010), Lastrapes (2002), Luciani, (2014), McDonlad & Stokes (2013), Ume (2018), Wadud et al. (2012) and Zhang (2013).

[7] The recursive estimation approach suggested by Abrahams & Hendershott (1996) is fundamentally similar as their 'bubble buster' term could be estimated via an error-correction model, as Hort (1998) noted.

[8] All of the variables examined were tested for stationarity using the standard Augmented Dickey-Fuller Unit Root tests. All of them were found to be stationary in the first difference. The results are available from the authors on request.

[9] The models was also re-estimated excluding the dummy variables. Whereas no evidence of non-normality was observed in the results reported in the paper, there was evidence, especially in the error-correction model, of non-normality. These would support the use of dummy variables to account for the outlying observations. The results from the alterative specifications are available from the authors upon request.

[10] Whilst used less frequently than standard event study methods, there are a large number of papers that have used a regression based approach in the finance and economics literature. A couple of recent examples are Chaudhry et al. (2018) and Perez-Truglia (2018).