APPENDIX 1. Milestones in China’s policies on the housing market, 2005–2014

<table>
<thead>
<tr>
<th>Date</th>
<th>Milestone Policies</th>
<th>Dummy variable $D=1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 2005</td>
<td>State Council issues eight directives to stabilize housing prices.</td>
<td>From January 2005 to June 2005</td>
</tr>
<tr>
<td>May 2006</td>
<td>State Council issues six directives on healthy development of housing market.</td>
<td>From March 2006 to August 2006</td>
</tr>
<tr>
<td>March 2007</td>
<td>Property Law enacted.</td>
<td>From January 2007 to June 2007</td>
</tr>
<tr>
<td>December 2008</td>
<td>State Council issues 13 directives to promote the healthy development of the housing market.</td>
<td>From October 2008 to March 2009</td>
</tr>
<tr>
<td>December 2009</td>
<td>State Council issues four directives to curb excessive increase in housing prices.</td>
<td>From October 2009 to March 2010</td>
</tr>
<tr>
<td>April 2010</td>
<td>State Council issues 11 new directives to stabilize housing prices.</td>
<td>From February 2010 to July 2010</td>
</tr>
<tr>
<td>January 2011</td>
<td>State Council issues eight new directives on healthy development of the housing market.</td>
<td>From November 2010 to April 2011</td>
</tr>
<tr>
<td>May 2012</td>
<td>The expansion of a property tax trial on more cities launched.</td>
<td>From March 2012 to August 2012</td>
</tr>
<tr>
<td>February 2013</td>
<td>State Council issues five directives to regulate the housing market.</td>
<td>From December 2012 to May 2013</td>
</tr>
<tr>
<td>May 2014</td>
<td>People’s Bank of China issues five directives to stabilize housing prices.</td>
<td>From March 2014 to August 2014</td>
</tr>
</tbody>
</table>

Source: Various announcements from the Central People’s Government of the People’s Republic of China (http://english.gov.cn/).

APPENDIX 2. Basic characteristics of 10 large cities (2014)

<table>
<thead>
<tr>
<th>Region</th>
<th>Location</th>
<th>Population (ten thousand)</th>
<th>Area (square km)</th>
<th>GDP (RMB billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beijing</td>
<td>North</td>
<td>2151.60</td>
<td>16800</td>
<td>2133.1</td>
</tr>
<tr>
<td>Tianjin</td>
<td>North</td>
<td>1516.81</td>
<td>11920</td>
<td>1572.3</td>
</tr>
<tr>
<td>Shanghai</td>
<td>East</td>
<td>2425.68</td>
<td>6219</td>
<td>2356.1</td>
</tr>
<tr>
<td>Nanjing</td>
<td>East</td>
<td>821.61</td>
<td>6582</td>
<td>882.1</td>
</tr>
<tr>
<td>Hangzhou</td>
<td>East</td>
<td>889.20</td>
<td>16596</td>
<td>920.1</td>
</tr>
<tr>
<td>Wuhan</td>
<td>South</td>
<td>1038.3</td>
<td>8494</td>
<td>1006.9</td>
</tr>
<tr>
<td>Guangzhou</td>
<td>South</td>
<td>1308.05</td>
<td>7434</td>
<td>1670.7</td>
</tr>
<tr>
<td>Shenzhen</td>
<td>South</td>
<td>1077.89</td>
<td>1953</td>
<td>1600.2</td>
</tr>
<tr>
<td>Chongqing</td>
<td>West</td>
<td>2991.40</td>
<td>82400</td>
<td>1426.5</td>
</tr>
<tr>
<td>Chengdu</td>
<td>West</td>
<td>1442.8</td>
<td>12121</td>
<td>1005.7</td>
</tr>
</tbody>
</table>


APPENDIX 3. Results of DSP–GJR–GARCH (1, 1) model based on different geographic distance weight matrix specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification 3_1</th>
<th>Specification 3_2</th>
<th>Specification 3_3</th>
<th>Specification 3_4</th>
<th>Specification 3_5</th>
<th>Specification 3_6</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta_{pop}$</td>
<td>0.170**</td>
<td>0.085</td>
<td>0.171**</td>
<td>0.082</td>
<td>0.185*</td>
<td>0.096</td>
</tr>
<tr>
<td>$\beta_{\text{income},t-1}$</td>
<td>0.162***</td>
<td>0.029</td>
<td>0.148***</td>
<td>0.026</td>
<td>0.176***</td>
<td>0.034</td>
</tr>
<tr>
<td>$\beta_{\text{unemp},t-1}$</td>
<td>-0.025</td>
<td>0.034</td>
<td>-0.013</td>
<td>0.032</td>
<td>-0.029</td>
<td>0.037</td>
</tr>
<tr>
<td>$\beta_{\text{rate},t-1}$</td>
<td>-0.016</td>
<td>0.010</td>
<td>-0.016*</td>
<td>0.009</td>
<td>-0.018</td>
<td>0.012</td>
</tr>
<tr>
<td>$\beta_{SZ}$</td>
<td>0.004</td>
<td>0.003</td>
<td>0.004</td>
<td>0.003</td>
<td>0.005</td>
<td>0.003</td>
</tr>
</tbody>
</table>

(Continued)
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification 3_1</th>
<th>Specification 3_2</th>
<th>Specification 3_3</th>
<th>Specification 3_4</th>
<th>Specification 3_5</th>
<th>Specification 3_6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>S.E.</td>
<td>Estimate</td>
<td>S.E.</td>
<td>Estimate</td>
<td>S.E.</td>
</tr>
<tr>
<td>( \beta_{\text{policy}} )</td>
<td>0.790*</td>
<td>0.478</td>
<td>0.758*</td>
<td>0.430</td>
<td>0.891</td>
<td>0.547</td>
</tr>
<tr>
<td>( \rho )</td>
<td>0.701***</td>
<td>0.026</td>
<td>0.718***</td>
<td>0.016</td>
<td>0.670***</td>
<td>0.025</td>
</tr>
<tr>
<td>( \delta )</td>
<td>-0.475***</td>
<td>0.090</td>
<td>-0.550***</td>
<td>0.028</td>
<td>-0.366***</td>
<td>0.040</td>
</tr>
<tr>
<td>( \varphi )</td>
<td>0.369***</td>
<td>0.131</td>
<td>0.352***</td>
<td>0.023</td>
<td>0.370***</td>
<td>0.019</td>
</tr>
<tr>
<td>( \lambda )</td>
<td>-0.231</td>
<td>0.148</td>
<td>-0.213***</td>
<td>0.030</td>
<td>-0.212***</td>
<td>0.021</td>
</tr>
<tr>
<td>( \omega_0 )</td>
<td>0.210***</td>
<td>0.046</td>
<td>0.223***</td>
<td>0.027</td>
<td>0.247***</td>
<td>0.027</td>
</tr>
<tr>
<td>( \omega_1 )</td>
<td>0.081***</td>
<td>0.014</td>
<td>0.082***</td>
<td>0.026</td>
<td>0.078***</td>
<td>0.019</td>
</tr>
<tr>
<td>( \omega_2 )</td>
<td>0.296***</td>
<td>0.022</td>
<td>0.152***</td>
<td>0.032</td>
<td>0.189***</td>
<td>0.037</td>
</tr>
<tr>
<td>( \gamma )</td>
<td>0.443***</td>
<td>0.066</td>
<td>0.486***</td>
<td>0.044</td>
<td>0.474***</td>
<td>0.032</td>
</tr>
<tr>
<td>( \psi_G )</td>
<td>0.010</td>
<td>0.011</td>
<td>0.024***</td>
<td>0.009</td>
<td>0.019***</td>
<td>0.006</td>
</tr>
<tr>
<td>( \psi_E )</td>
<td>0.195***</td>
<td>0.014</td>
<td>0.238***</td>
<td>0.036</td>
<td>0.220***</td>
<td>0.028</td>
</tr>
<tr>
<td>( \alpha )</td>
<td>0.150***</td>
<td>0.023</td>
<td>0.743***</td>
<td>0.056</td>
<td>0.796***</td>
<td>0.088</td>
</tr>
<tr>
<td>( \beta )</td>
<td>0.077***</td>
<td>0.017</td>
<td>0.510***</td>
<td>0.046</td>
<td>0.396***</td>
<td>0.093</td>
</tr>
<tr>
<td>( \delta )</td>
<td>0.105***</td>
<td>0.018</td>
<td>0.748***</td>
<td>0.037</td>
<td>1.000***</td>
<td>0.108</td>
</tr>
<tr>
<td>( \xi )</td>
<td>5.862***</td>
<td>0.348</td>
<td>5.794***</td>
<td>1.044</td>
<td>5.825***</td>
<td>0.835</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.337</td>
<td>0.378</td>
<td>0.279</td>
<td>0.430</td>
<td>0.362</td>
<td>0.360</td>
</tr>
<tr>
<td>LL</td>
<td>-1749.9</td>
<td>-1745.0</td>
<td>-1749.4</td>
<td>-1745.2</td>
<td>-1746.6</td>
<td>-1748.1</td>
</tr>
<tr>
<td>RMSE</td>
<td>1.439</td>
<td>1.395</td>
<td>1.501</td>
<td>1.335</td>
<td>1.413</td>
<td>1.415</td>
</tr>
</tbody>
</table>

Notes: Specifications C1-C6 are under different kernel functions: (Specification C1) \( w_{ij}^G = \begin{cases} \frac{1}{2}(d_{ij}/125)^2 & \text{if } d_{ij} \leq 125, \\ 0 & \text{if } d_{ij} > 125, \end{cases} \) (Specification C2) \( w_{ij}^G = \begin{cases} \frac{1}{2}(d_{ij}/2020)^2 & \text{if } d_{ij} \leq 2020, \\ 0 & \text{if } d_{ij} > 2020, \end{cases} \) (Specification C3) \( w_{ij}^G = \begin{cases} \frac{1}{2}(d_{ij}/2842)^2 & \text{if } d_{ij} \leq 2842, \\ 0 & \text{if } d_{ij} > 2842, \end{cases} \) (Specification C4) \( w_{ij}^G = \begin{cases} \frac{1}{2}(d_{ij}/1591)^2 & \text{if } d_{ij} \leq 1591, \\ 0 & \text{if } d_{ij} > 1591, \end{cases} \) (Specification C5) \( w_{ij}^G = \begin{cases} \exp\left(-\frac{1}{2}(d_{ij}/1591)^2\right) & \text{if } d_{ij} \leq 1591, \\ 0 & \text{if } d_{ij} > 1591, \end{cases} \) (Specification C6) \( w_{ij}^G = \begin{cases} \frac{1}{2}(d_{ij}) & \text{if } d_{ij} \leq 1591, \\ 0 & \text{if } d_{ij} > 1591, \end{cases} \) The first and third quartile cutoff distances are 1125 km and 2020 km, respectively. The maximum distance in our sample is 2842 km between Hangzhou and Chengdu. \( \beta_{\text{pop,income,t-1}}, \beta_{\text{unemp},t-1}, \beta_{\text{rate},t-1}, \beta_{\text{policy}} \) represent the coefficients of the contemporaneous growth rate of the urban total population, one-period lagged growth rate of the per-capita disposable income of urban households, one-period lagged registered urban unemployment rate, and one-period lagged fixed mortgage rate, respectively. \( \beta_{\text{SZ,t}} \) is the coefficient of the one-period lagged monthly returns of the Shanghai Composite Index. \( \beta_{\text{policy}} \) is the coefficient for the dummy variable \( D \) which is used to reflect the effects of the national macro-control policy issued by the State Council in May 2006 on the regional housing returns and the dummy variable \( D \) takes a value of 1 covering the period from March 2006 to August 2006 and takes a value of 0 otherwise. \( R^2 \) is the goodness-of-fit. \( LL \) stands for the maximum log-likelihood function value. \( RMSE \) represents the root-mean-square error. The signs ‘*’, ‘**’, and ‘***’ denote significance at the 0.01, 0.05, and 0.1 levels, respectively.
### APPENDIX 4. Results of DSP–GJR–GARCH (1, 1) model based on different specifications of the explanatory variables

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>S.E.</td>
<td>Estimate</td>
<td>S.E.</td>
<td>Estimate</td>
<td>S.E.</td>
<td>Estimate</td>
</tr>
<tr>
<td>( \beta_{\text{pop}} )</td>
<td>0.193***</td>
<td>0.081</td>
<td>0.181***</td>
<td>0.082</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>( \beta_{\text{income},t-1} )</td>
<td>0.150***</td>
<td>0.027</td>
<td>0.138***</td>
<td>0.027</td>
<td>0.157***</td>
<td>0.027</td>
<td>0.139***</td>
</tr>
<tr>
<td>( \beta_{\text{unemp},t-1} )</td>
<td>-0.009</td>
<td>0.031</td>
<td>-0.008</td>
<td>0.032</td>
<td>0.002</td>
<td>0.032</td>
<td>-0.008</td>
</tr>
<tr>
<td>( \beta_{\text{rate},t-1} )</td>
<td>-0.015</td>
<td>0.009</td>
<td>-0.015</td>
<td>0.010</td>
<td>-0.016*</td>
<td>0.010</td>
<td>-0.016</td>
</tr>
<tr>
<td>( \beta_{\text{SZ},t-1} )</td>
<td>0.004</td>
<td>0.003</td>
<td>-</td>
<td>-</td>
<td>0.004</td>
<td>0.003</td>
<td>0.004</td>
</tr>
<tr>
<td>( \beta_{\text{policy}} )</td>
<td>-</td>
<td>-</td>
<td>1.318***</td>
<td>0.264</td>
<td>1.309***</td>
<td>0.263</td>
<td>1.301***</td>
</tr>
<tr>
<td>( \rho )</td>
<td>0.708***</td>
<td>0.035</td>
<td>0.710***</td>
<td>0.019</td>
<td>0.709***</td>
<td>0.034</td>
<td>0.709***</td>
</tr>
<tr>
<td>( \delta )</td>
<td>-0.512***</td>
<td>0.072</td>
<td>-0.521***</td>
<td>0.044</td>
<td>-0.523***</td>
<td>0.074</td>
<td>-0.525***</td>
</tr>
<tr>
<td>( \phi )</td>
<td>0.384***</td>
<td>0.033</td>
<td>0.376***</td>
<td>0.198</td>
<td>0.376***</td>
<td>0.049</td>
<td>0.374***</td>
</tr>
<tr>
<td>( \lambda )</td>
<td>-0.240***</td>
<td>0.048</td>
<td>-0.233</td>
<td>0.152</td>
<td>-0.230***</td>
<td>0.043</td>
<td>-0.234***</td>
</tr>
<tr>
<td>( \omega_0 )</td>
<td>0.149**</td>
<td>0.072</td>
<td>0.160**</td>
<td>0.063</td>
<td>0.165***</td>
<td>0.060</td>
<td>0.162***</td>
</tr>
<tr>
<td>( \omega_1 )</td>
<td>0.083***</td>
<td>0.042</td>
<td>0.080***</td>
<td>0.023</td>
<td>0.085***</td>
<td>0.025</td>
<td>0.083***</td>
</tr>
<tr>
<td>( \omega_2 )</td>
<td>0.214***</td>
<td>0.045</td>
<td>0.200***</td>
<td>0.063</td>
<td>0.199***</td>
<td>0.073</td>
<td>0.202***</td>
</tr>
<tr>
<td>( \gamma )</td>
<td>0.449*</td>
<td>0.248</td>
<td>0.452*</td>
<td>0.240</td>
<td>0.449***</td>
<td>0.048</td>
<td>0.450***</td>
</tr>
<tr>
<td>( \psi_G )</td>
<td>0.021</td>
<td>0.013</td>
<td>0.022</td>
<td>0.015</td>
<td>0.018</td>
<td>0.012</td>
<td>-</td>
</tr>
<tr>
<td>( \psi_E )</td>
<td>0.498***</td>
<td>0.122</td>
<td>0.484***</td>
<td>0.221</td>
<td>0.496***</td>
<td>0.067</td>
<td>0.477***</td>
</tr>
<tr>
<td>( \alpha )</td>
<td>0.464*</td>
<td>0.258</td>
<td>0.490*</td>
<td>0.240</td>
<td>0.501***</td>
<td>0.060</td>
<td>0.490***</td>
</tr>
<tr>
<td>( \beta )</td>
<td>0.503***</td>
<td>0.165</td>
<td>0.558***</td>
<td>0.079</td>
<td>0.563***</td>
<td>0.158</td>
<td>0.535***</td>
</tr>
<tr>
<td>( \delta )</td>
<td>0.480</td>
<td>0.339</td>
<td>0.518***</td>
<td>0.100</td>
<td>0.524***</td>
<td>0.116</td>
<td>0.510***</td>
</tr>
<tr>
<td>( \xi )</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.388</td>
<td>0.400</td>
<td>0.401</td>
<td>0.401</td>
<td>0.401</td>
<td>0.401</td>
<td>0.401</td>
</tr>
<tr>
<td>( LL )</td>
<td>-1788.3</td>
<td>-1785.9</td>
<td>-1788.2</td>
<td>-1785.1</td>
<td>-1740.9</td>
<td>-1746.7</td>
<td>-1746.7</td>
</tr>
<tr>
<td>( RMSE )</td>
<td>1.383</td>
<td>1.369</td>
<td>1.368</td>
<td>1.368</td>
<td>1.346</td>
<td>1.345</td>
<td>1.345</td>
</tr>
</tbody>
</table>

**Notes:** The table presents the regression results based on different specifications of the explanatory variables. \( \beta_{\text{pop}}, \beta_{\text{income},t-1}, \beta_{\text{unemp},t-1} \) and \( \beta_{\text{rate},t-1} \) represent the coefficients of the contemporaneous growth rate of the urban total population, one-period lagged growth rate of the per-capita disposable income of urban households, one-period lagged registered urban unemployment rate, and one-period lagged fixed mortgage rate, respectively. \( \beta_{\text{SZ},t-1} \) is the coefficient of the one-period lagged monthly returns of the Shanghai Composite Index. \( \beta_{\text{policy}} \) is the coefficient for the dummy variable D, which is used to reflect the effects of the national macro-control policy issued by the State Council in May 2006 on the regional housing returns and the dummy variable D takes a value of 1 covering the period from March 2006 to August 2006 and takes a value of 0 otherwise. \( R^2 \) is the goodness-of-fit. \( LL \) stands for the maximum log-likelihood function value. \( RMSE \) represents the root-mean-square error. The signs ***, **, and* denote significance at the 0.01, 0.05, and 0.1 levels, respectively.