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Real Estate Prices During the Roaring Twenties and the Great Depression

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Using new data on market-based transactions we construct real estate price indexes for Manhattan between 1920 and 1939. During the 1920s prices reached their highest level in the third quarter of 1929 before falling by 67% at the end of 1932 and hovering around that value for most of the Great Depression. The value of high-end properties strongly co-moved with the stock market between 1929 and 1932. A typical property bought in 1920 would have retained only 56% of its initial value in nominal terms two decades later. An investment in the stock market index (including dividends) would have outperformed an investment in a typical property (including net rental income) by a factor of 5.2 over our time period.

It is often assumed that the Great Depression was associated with both stock market and real estate shocks (*e.g.*, Shiller 2006, Piazzesi, Schneider and Tuzel 2007), especially in light of the recent sub-prime financial crisis where parallels with the past are frequently drawn (Reinhart and Rogoff 2009). Yet empirical evidence on movements in real estate prices is limited for this time period. We construct the first high-frequency real estate quarterly index using transaction prices for Manhattan, a major market in the United States. We use the new data to examine stock market and real estate cycles during one of the most significant crises in U.S. economic and financial history.

We show that the real estate market suffered a sudden and severe downturn in 1929, from which it still had not recovered in 1939. Although Manhattan represents a small geographic area, in 1930 it contained approximately 4% of all United States real estate wealth despite having 1.5% of the population.[1] Moreover, Long Jr. (1936) writes that between 1919 and 1933, the total value of building plans for Manhattan was "only slightly less than 10% of the total

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[1] In 1930 the assessed value of real estate in Manhattan was $9.9 billion according to the Department of Taxes and Assessments. Wickens (1941) estimates the total real estate of the country to be worth $266.3 billion (p. 3).

for 310 United States cities (Manhattan included) during the same period" (p. 183).

To construct our indexes we hand-collected real estate transaction data for Manhattan from the *Real Estate Record and Builders' Guide*, a weekly publication of real estate transactions, land, mortgage and building permit listings as well as commentary on the market for real estate. We identified transactions that occurred at market prices and, using over 7,500 market-based observations, we construct nominal and CPI-adjusted real estate price indexes.

We employ constant-relative-value and adjacent-period hedonic regression methodologies, making use of all property characteristics that are available to construct indexes with quarterly and annual time dummies. Both approaches minimize the cross-sectional and time series data requirements. Our constant-relative-value hedonic regression specification assumes that the relative prices of house characteristics are constant over time, whereas our adjacent-period approach assumes that the relative characteristic prices are the same only over two adjacent time periods. We show that general movements in real estate prices in Manhattan during the 1920s and 1930s are robust to these alternate index construction methodologies.

Our indexes reveal that prices for a typical property reached a local peak in 1926. They then fell and rebounded to reach their highest peak in 1929, coincidently with the high point of the late 1920s stock market run-up. From then prices fell to a new low by 1932, and they did not recover for the remainder of the 1930s. We show that high-value properties were more likely to be synchronized with the stock market between 1929 and 1932 but that overall returns to real estate during the 1920s and 1930s were low. When we account for the net rental income generated in the total return, an investment in the stock market index would have outperformed an investment in the real estate index more than five-fold between 1920 and 1939. That is, real estate was much slower to rebound than the stock market.

The remainder of the paper is structured as follows. The next section reviews related literature. The third section describes our data on Manhattan real estate transactions. The fourth section explains the construction of real estate price indexes. The fifth section describes the main trends in the indexes and discusses their plausibility. The final section concludes.

Review of Related Literature

Our paper is related to a long line of research highlighting the significance of real estate and real estate cycles. Long Jr. (1936 and 1939) focuses on the

relationship between building and business cycles during the nineteenth and early twentieth century. He maintains that building cycles typically lasted 18 to 19 years during his sample period. Summarizing the literature on the "long cycle" for real estate returns Kaiser (1997) suggests a cycle of at least 50 years, although a much shorter period of time elapsed between the real estate downturn in the late 1980s and early 1990s and the fall in real estate returns associated with the 2008 financial crisis. While the precise timing of real estate cycles is open to debate, the fact that movements in real estate cycles have a large aggregate economic impact is unequivocal. Wickens' (1941) study opens by stating that "the value of real property exceeds that of any other form of wealth in the United States" (p. 1). It provides a variety of descriptive statistics for real estate markets and shows that U.S. real estate wealth declined significantly during the depression years.[2]

The decline of real estate prices during the Great Depression is also covered by Hoyt (1933) in his famous analysis of Chicago land values from 1830 to 1933. He shows that land values fell by 50% between 1928 and 1932 and that the decline in prices was especially pronounced for commercial real estate and high-end apartments (p. 273). Other studies of real estate at this time include Field (1992), who argues that uncontrolled land development during the 1920s contributed to the severity of the Great Depression because it created obstacles to investment in new construction, or redevelopments, during the 1930s. Fishback, Horrace and Kantor (2001) and Fishback, Lagunes, Horrace, Kantor and Treber (2011) evaluate the impact of government programs aimed at helping the recovery of real estate markets during the Great Depression. They find some evidence that the Home Owners Loan Corporation (HOLC) provided a boost to the housing market but mostly in smaller cities with less developed financial institutions where government intervention to re-finance troubled mortgages could have a positive effect on demand. Ghent (2011) finds that in a more institutionally robust area—the New York City metropolitan area—a reluctance on the part of lenders to renegotiate the terms of mortgages during the 1930s significantly increased the likelihood of foreclosure.

Several studies examine real estate prices in New York for various historical time periods. Using rents collected from newspapers to form a hedonic index of rent prices for Manhattan and other proximate areas between 1830 and 1860, Margo (1996) finds that rents increased faster than a cost of living index that excludes housing. Using data in the form of individual market-based transactions, Atack and Margo (1998) calculate nominal land prices in the business

[2]Methodologically, the study relies mostly on aggregate data series, which include the Census of Population, The Federal Real Property Inventory of 1934, the Financial Survey of Urban Housing and the Bureau of Labor Statistics reports on Building Permits.

district around New York's City Hall for the period 1835 to 1900, which reveals a flattening price gradient over time as the city developed spatially. Spengler (1930) shows a rise in assessed land values in areas influenced by the subway system in Manhattan, the Bronx, Brooklyn and Queens between 1905 and 1929. Grebler (1955) derives an extensive set of indexes based on income and expense data for 581 properties in New York City between 1900 and 1950. These series imply a large rise in property values during the 1920s followed by dramatic losses during the Great Depression. Wheaton, Baranski and Templeton (2009) provide inflation-adjusted values of Manhattan commercial property between 1899 and 1999 and calculate negative real gains over the period. Because they use a repeat-sales methodology they are restricted to 86 transactions.

Finally, although the focus of our study is solely on New York real estate, the time period we cover includes the Florida real estate bubble and its collapse, which are described by Shiller (2005) and White (2008). According to White (2008), the real estate bubble of the mid-1920s occurred not just in Florida but nation-wide, and its collapse weakened household balance sheets prior to the market crash and exacerbated the recession that followed. The effect of the collapse in prices is visible in the United-States-wide single-family home price index of Shiller (2005) and in the real estate bond price index of Goetzmann and Newman (2009). According to Goetzmann and Newman (2009) speculation in real estate securities played an important role in leading to an overbuilding boom during the Roaring Twenties and in creating a chain of events leading to the Great Crash and the Great Depression. In 1925 real estate bond issues accounted for almost one quarter of all corporate debt issued. By 1934 the share had fallen to just 0.14% (p. 18).

The Data

We hand-collected data on real estate transactions from the professional publication of the New York City agents and builders—the *Real Estate Record and Builders' Guide*. These annual volumes present data on individual transactions and monthly summaries of real estate activities for all of the New York City boroughs. This source is particularly useful for gaining information on market transactions. Grebler (1955, p. 194), states:

> [although] the data in *Record and Guide* cover a varying percentage of total bona fide sales recorded each year [they do include] those for which it was possible to obtain confidential information on actual consideration, as distinguished from newspaper announcements (which often list consideration over and above a mortgage) and from amounts computed on the basis of tax transfer stamps.

For the purposes of constructing price indexes, we randomly collected 30 transactions per month for Manhattan between 1920 and 1939.[3] We focus our efforts on Manhattan because it contained a disproportionate amount of real estate wealth for its population size and particularly good transactions data exist.[4] We make sure that these transactions are marked as having occurred at market prices rather than being "in-kind" transactions or transactions between related parties. We partition Manhattan into ten neighborhoods (listed in Panel C of Table 1). Figure 1 shows the location of Manhattan relative to the other four New York City boroughs,[5] and Figure 2 shows the locations of the ten Manhattan neighborhoods.

The transaction records include variables that we utilize in the constant-relative-value and adjacent-period hedonic regressions. A typical transaction is listed as follows:

> Crosby st, 31 (2:473-28) es abt 130 n Grand, 25x100, 7-sty bk tnt & str. A$13,500-24,000. **18,500**

Here we have the address of the building (the section, block and lot number are in parentheses), which we subsequently geocoded to get its precise location and zip code (this building is in zip code 10013, which is in the Greenwich Village - Soho area), its orientation (es = east side of the street), 130 feet north of Grand Street, the size of the lot, the number of stories (7-sty = seven stories), construction material (bk = brick), building designation (tnt = tenement), assessed value ($13,500–24,000, where the lower figure is the estimated value of just the land and the upper figure is the total estimated value), and we know it had a store on the first floor (str). The total square footage of the building is computed by multiplying together the lot dimensions and the number of stories (since the lot size was typically very close to the floor size). Finally, in bold text, the sale amount the seller received is given, which indicates the fair market price.[6]

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[3]In some months fewer than 30 market-based transactions were available due to the number of foreclosures. In these months we collected as close to 30 market-based transactions as possible and we then added an additional 30 randomly chosen foreclosure transactions per month.

[4]Changes in the index cannot be explained by fluctuations in the population of Manhattan, which, according to the Census survey declined by 18% during the first decade of our sample and increased by 1.2% during the second decade (see also Glaeser 2005, p. 10).

[5]The borough of Richmond was renamed the borough of Staten Island in 1975.

[6]We make further effort to include only transactions that took place at market prices by removing observations where the price-to-assessed-value ratio is in the top

Table 1 ■ Sample description.

Building Designation					
Panel A: Types of Houses					
Tenement					52.71%
Dwelling					27.69%
Loft					10.43%
Other					9.17%
Construction Material					
Brick					72.14%
Stone					26.65%
Other					1.21%
Additional Features					
Store on 1st Floor					33.17%
Basement					4.58%
Number of Stories					
1					2.38%
2					3.82%
3					18.73%
4					23.09%
5					37.00%
6					10.66%
7					1.56%
8 and over					2.76%
Total No. Obs.					7,538
Panel B: Fraction of Observations by Zipcode					
10001	2.52%	10017	1.47%	10031	2.33%
10002	7.32%	10018	1.21%	10032	1.31%
10003	4.02%	10019	3.04%	10033	0.89%
10004	0.52%	10020	0.13%	10034	0.53%
10005	0.49%	10021	2.59%	10035	3.93%
10006	0.54%	10022	2.87%	10036	1.99%
10007	2.02%	10023	3.52%	10037	1.35%
10009	3.34%	10024	3.50%	10038	1.07%
10010	1.80%	10025	3.99%	10039	0.42%
10011	4.11%	10026	3.50%	10040	0.32%
10012	1.94%	10027	4.91%	10065	1.87%
10013	3.28%	10028	2.48%	10075	1.55%
10014	2.76%	10029	6.50%	10128	2.53%
10016	3.57%	10030	1.92%	10280	0.01%

Table 1 ■ Continued

Panel C: Manhattan Neighborhoods and the Corresponding Zipcodes

Central Harlem-Morningside Heights	10026, 10027, 10030, 10037, 10039	13.00%
Chelsea - Clinton	10001, 10011, 10018, 10019, 10020, 10036	12.11%
East Harlem	10029, 10035	10.43%
Gramercy Park - Murray Hill	10010, 10016, 10017, 10022	9.71%
Greenwich Village - Soho	10012, 10013, 10014	7.97%
Lower Manhattan	10004, 10005, 10006, 10007, 10038, 10280	4.66%
Union Square - Lower East Side	10002, 10003, 10009	14.69%
Upper East Side	10021, 10028, 10128, 10065, 10075	11.03%
Upper West Side	10023, 10024, 10025	11.01%
Washington Heights - Inwood	10031, 10032, 10033, 10034, 10040	5.39%

Panel D: Sale Price Statistics by Year

Year	Price			Price/Square Foot			Percent of
	Mean	Median	St. Dev.	Mean	Median	St.Dev.	Foreclosures
1920	$42,484.46	$25,000.00	$61,900.96	$4.21	$2.67	$5.79	0.00%
1921	$40,095.82	$22,000.00	$62,111.79	$3.89	$2.48	$5.27	0.00%
1922	$43,318.62	$26,250.00	$60,453.64	$3.99	$2.65	$4.84	0.00%
1923	$47,429.89	$28,000.00	$64,410.97	$4.07	$2.69	$5.05	0.00%
1924	$44,373.98	$30,000.00	$46,602.85	$4.21	$3.08	$5.02	0.00%
1925	$60,610.19	$33,850.00	$81,815.41	$4.96	$3.23	$5.20	0.00%
1926	$62,732.08	$35,000.00	$83,834.75	$6.22	$3.79	$7.69	0.00%
1927	$61,495.56	$35,250.00	$76,393.15	$5.65	$3.64	$6.62	0.00%
1928	$65,875.23	$35,500.00	$90,912.66	$5.64	$3.34	$7.70	0.00%
1929	$75,733.53	$40,000.00	$100,976.10	$6.91	$3.82	$8.38	0.00%
1930	$56,437.11	$25,000.00	$86,175.37	$4.18	$2.07	$6.77	49.24%
1931	$51,335.46	$20,000.00	$81,777.72	$3.12	$1.65	$4.23	60.61%
1932	$45,736.64	$20,000.00	$75,643.27	$2.89	$1.61	$4.69	74.19%
1933	$59,694.74	$22,000.00	$97,203.78	$2.90	$1.72	$4.65	98.09%
1934	$57,102.75	$21,000.00	$95,183.79	$3.10	$1.70	$5.78	100.00%
1935	$42,941.29	$20,000.00	$73,950.08	$2.39	$1.69	$2.77	55.38%
1936	$37,400.37	$17,500.00	$66,238.79	$2.81	$1.75	$4.77	0.00%
1937	$29,869.22	$17,500.00	$43,247.65	$2.61	$1.66	$4.87	0.00%
1938	$31,693.69	$15,500.00	$53,855.95	$2.74	$1.53	$5.02	0.00%
1939	$30,307.51	$15,000.00	$42,162.28	$2.29	$1.50	$4.22	0.00%
All	$49,022.87	$25,000.00	$75,317.03	$3.84	$2.22	$5.66	24.94%

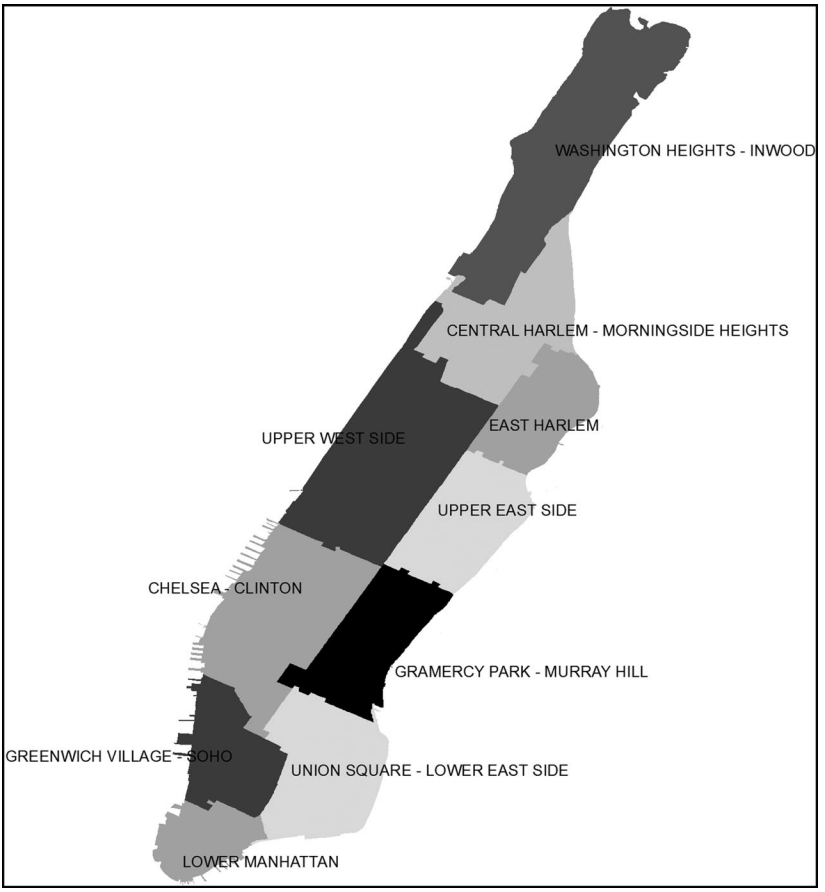
Note: This table describes the hand-collected transaction sample used in the index construction.

Figure 1 ■ New York City boroughs.

Table 1 provides descriptive statistics for our resulting data. We have 7,538 observations in total. (We observe 320 properties being sold twice and 17 being sold three times such as 1453 Amsterdam Avenue, in Central Harlem-Morningside Heights, which sold for $27,750 in February 1931, $26,000 under foreclosure in June 1932, and $18,500 in May 1937.) Foreclosures are identified clearly in the records as shown in the following example:

99th percentile of the distribution (fearing that the transaction price was too high relative to the true value of the building) or where price is less than 10% of the assessed value (to remove the possibility that the transaction occurred between related parties). For that reason, we also remove transactions priced at less than $500. Finally, in order to remove recording or data entry errors, we winsorize transaction prices by setting the prices above the 99th percentile or below the 1st percentile of the distribution equal to their respective boundaries.

Figure 2 ■ Manhattan neighborhoods.



111th st, 140-142 W (7:1820-53) ss, 250 e 7 av. 37.6x100.11 5-sty tnt FORECLOS A$36,000-60,000. **30,000**

Foreclosure transactions account for a large share of our observations between 1930 and 1935, and we control for these in some of our regression specifications.

While Wickens (1941, p. 3), calculates that around 1930 most dwellings in the United States had values of under $5,000, we find a much higher median price of $30,000. This reflects the preponderance of multi-family dwellings and commercial buildings in Manhattan. Indeed, most of the transactions in

our data involve tenements.[7] Tenements were generally lower-income housing and were defined under New York laws as:

> Any house or building or portion thereof, which is either rented, leased, let or hired out to be occupied, or is occupied, in whole or in part as the home of residence of three families or more living independently of each other and doing their cooking upon the premises, and includes apartment houses, flat houses and all other houses so occupied. (Lyle 1920, p. 239)

Tenements were the most prevalent in the neighborhoods of East Harlem (representing 78% of transactions there) and Union Square - Lower East Side (76% of transactions). Most tenements were constructed out of brick (81%), as opposed to 19% being built out of stone, and 61% contained a store on the first floor. The median tenement had five stories, and the tallest in our sample had 11 stories.

Dwellings were most prevalent in the Upper West Side (63% of total transactions in that area) and Washington Heights - Inwood (54% of transactions). Only 2% of dwellings included a store. Located in more prestigious neighborhoods and with fewer built-in stores than an average tenement, dwellings were simply the high-end buildings. They ranged in height between one and 16 stories, with the median dwelling being four stories tall; 50% were built out of stone and 49% out of brick.

Lofts were most prevalent in Lower Manhattan (representing 49% of all transactions observed there) and Greenwich Village - Soho (42%). Page (2005, p. 178), describes them as:

> Narrow and tall with long dark interiors, usually built upon one or two 25-foot lots previously occupied by brownstones, the buildings were appropriate for factories or cheap business ventures.

They became more common in the early twentieth century as steel skeletal structures allowed multi-storey buildings to be constructed with large open interior spaces, and they were particularly popular locations for garment-related industries. Of all lofts 81% were constructed out of brick and 18% out of stone. Fewer than 2% contained a store. The median loft had five stories, and the tallest in our sample was 16 stories high.

[7] During the Great Depression, a typical rent for a three-room, 350-square-foot apartment in a tenement was $18 a month. Such apartments typically housed families of five to six people. Tenements had only minimal amenities mandated by law. Electricity was added some time in the late 1910s or early 1920s, and even as late as the 1930s, few tenements had central heating instead relying on coal stoves for heat.

The "Other" building designation was predominately found in Lower Manhattan (23% of all transactions we recorded there), Chelsea - Clinton (15%), and Gramercy Park - Murray Hill (12%). These buildings ranged in height between one and 16 stories, with the median building of that type being only three stories high, and 5% of the buildings included a store; 11% were built out of stone and 81% our of brick. This "catch-all" building designation was, perhaps, the most heterogeneous and included private houses and commercial buildings.

Almost three quarters of the transactions in our sample are associated with buildings constructed out of brick. The most common type of property sold is a five-story building. One-third of the transaction sample are buildings that contained a store. In fact, this feature was the most prevalent in buildings in Union Square - Lower East Side (observed in 65% of all transactions there) and East Harlem (52% of transactions), perhaps because these neighborhoods contained more tenements, which typically included a store. For the eight other Manhattan neighborhoods, this number was below 32%. Almost 5% of buildings contained a basement. While being a more common feature in buildings under seven stories tall, the store could be also found in taller buildings. On the other hand, no building taller than six stories contained a basement in our sample, and this feature was most common in three-story buildings. Basements were much more prevalent in dwellings (found in 16% of all dwellings in our sample) and very rare among other building designations (found in fewer than 1% of such buildings).

In terms of height, almost 3% of our transactions are for buildings eight stories and higher. Eight buildings in our sample have 16 stories, which is about half the height of Manhattan's smallest skyscraper (Barr 2010).

Panel D of the table presents summary statistics on transaction prices by year. It can be seen that average and median prices, as well as prices scaled by the total squared footage of the building, rose from the beginning of the sample to 1929 and declined from then on. We will see that this pattern is consistent with the indexes that we construct from these transactions data. The percentage of the transactions which are foreclosures are reported in the last column.[8]

The remainder of the data we use were gathered from various sources. The CPI index is from the United States Census Bureau, Statistical Abstract of the United States, No. HS-36. Data on historical stock market returns are provided by G. William Schwert.[9] Additionally, we obtained all new building

[8]Transactions were flagged as foreclosures by the *Real Estate Record and Builder's Guide* prior to 1930, but where possible we relied on normal market transactions.

[9]http://schwert.ssb.rochester.edu/data.html.

applications filed in Manhattan for each year, from 1920 to 1939 from the Office for Metropolitan History in New York. Not all building permits were carried through to completion and some plans changed in scope after the initial application was filed. The data are, however, recorded net of alterations to existing structures. Aggregate data on stock issuance were collected from the NBER Macrohistory databases.[10]

Methodology

Since a property does not trade most of the time, its value is predominantly unknown. Market transaction prices are the most reliable source of information for valuation, and there are three commonly used methods of constructing price indexes. The first simply computes an average or a median price over all transactions, without any attempt to control for the heterogeneity of sold houses. A more advanced index of that sort is computed for a specific housing type, such as, for example, a semidetached house of a certain size and quality. But the finer the partition, the greater are the data requirements. The advantage is ease of computing. The big drawback is that the selection of houses being sold may vary endogenously. The second commonly used index is the repeat sales index. It is estimated based on price changes of the same house between subsequent transactions that are then weighted across houses. Repeat-sales indexes require a long time series and a large cross-section of data, otherwise they produce unreliable estimates (Meese and Wallace 1991 and Clapp, Giaccotto and Tirtiroglu 1991). Moreover, the index may produce biased estimates if the selection of houses that transact frequently is atypical; for example, if such houses tend to be of a higher quality than the general housing stock. The third index is the hedonic price index. It views a house as a collection of priced services and sums up these prices to obtain the value of a house. This methodology has many advantages. Most importantly for us, it makes the most efficient use of the data and thus minimizes data requirements (Diewert 2007). One potential drawback is the need to collect information on the multitude of house attributes that influence the value of the house, and these data may be unavailable. However, due to the high level of collinearity in house characteristics, Butler (1982) suggests that "approximate correctness" can be achieved with fewer inputs than is generally thought.[11]

[10]http://www.nber.org/databases/macrohistory/contents/chapter10.html.

[11]In light of the shortcomings with each type of index, Case, Pollakowski and Wachter (1991) and Case and Quigley (1991) advocate combining the hedonic and the repeat-sales for a hybrid approach that leads to least bias and most informational efficiency. See also Hoffman and Lorenz (2006), Rappaport (2007) and Diewert (2007) for detailed discussions of different price indexes.

Since our dataset is limited in both the time series and the cross-section, it makes the most sense to use the constant-relative-value hedonic methodology for constructing price indexes. With this approach, a time series of price changes can be constructed in two ways: (1) by running hedonic regressions and computing the value of a representative house in every period, or (2) by running a pooled regression and employing time dummies to capture the time change in prices. Unlike the first method, the second is less flexible in that it assumes that the prices of house characteristics remain constant over time. However, this approach offers an important advantage in that it conserves degrees of freedom and reduces data requirements. As a robustness check, we also construct indexes using the adjacent-time-period hedonic regression approach, which fixes the relative prices of house characteristics only in adjacent time periods.

The hedonic regression literature has yet to reach a consensus on the best specification for the pricing regression. The discussion centers on what types of house characteristics should be included, whether house prices should be converted to logged values and/or scaled by square footage, whether or not continuous house characteristics should also be logged, whether regressions should be run every period or pooled with time dummies included, and so on. Diewert (2003) systematically addresses these open questions and offers suggestions. In particular, he argues that the log-price specification will more likely result in more homoscedastic errors. For us, transforming our only continuous variable, the square footage, into logs makes sense because the vast majority of properties being sold in Manhattan are apartment buildings, and one would expect those prices to be proportional to the number of apartments they contain. Hence, some sort of a ratio of price to the square footage of the building would best capture this proportionality.

Suppose P_{kt} is the market price of property k sold at time t, and p_{kt} is its natural logarithm. Furthermore, let us assume that we collect N priced property characteristics for each transaction that fully describe each property and that these characteristics remain invariant through time: $z_k \equiv [z_{k1}, z_{k2}, \ldots, z_{kN}]$. We use all of the property characteristics described in Table 1, as well as the neighborhood dummies to run the following regression, pooled over the time series and the cross-section, of properties being sold:

$$p_{kt} = \alpha_t D_t + \sum_{n=1}^{N} z_{kn}\beta_n + \epsilon_{kt} \tag{1}$$

where D_t is the time dummy taking the value of one for the time period t when the property k is sold and zero otherwise. According to this model, a property κ can be priced at each point of time τ based on its unique characteristics and

the estimated prices that these characteristic command:

$$\hat{P}_{\kappa\tau} = exp(\hat{\alpha}_\tau) \times exp(\hat{\beta}_1 z_{\kappa 1}) \times exp(\hat{\beta}_2 z_{\kappa 2}) \times \cdots \times exp(\hat{\beta}_N z_{\kappa N}) \quad (2)$$

We set the price index equal to the proportional change in the value of the property relative to the initial period. We normalize the initial price to be \$1, and the index, therefore, reports the return on the initial investment. Note that since the relative prices of property characteristics are assumed to be constant through time, the price change of any property is captured entirely by the coefficients on the time dummies. At each point of time τ, the level of the index is, therefore, equal to the ratio of the exponents of the time dummy coefficient at time τ and the time dummy coefficient at time 0, or the exponent of the difference: $exp(\hat{\alpha}_\tau - \hat{\alpha}_0)$.[12]

The assumption that relative prices of property characteristics are constant over time works well for relatively short time periods, but we also check whether our indexes change if this assumption is relaxed. For this purpose, we employ the adjacent-period hedonic regression approach, which assumes that the relative characteristic prices are the same only over two adjacent time periods. The regression of the form of Equation (1) is run for every two consecutive time periods, with a dummy variable D indicating the next time period. Once a series of the time dummy coefficients, α_t is obtained, the value of the index in period τ is computed as a product of the exponentials of the time dummies.

Results

Table 2 presents the regression coefficients of the quarterly constant-relative-value hedonic regression of the natural logarithm of the transaction price on the building characteristics, specified according to Equation (1). The coefficient on the log-value of square footage is only 0.61 rather than 1.00, indicating that each additional square foot of size has a smaller effect on the price increase. This declining effect of square footage on price is consistent with other evidence in the real estate literature. As the square footage of the building base increases, more interior space ends up without a window. If the square footage increase is achieved through adding floors, the square footage on the higher floors may command a lower price due to the lack of elevators and/or additional maintenance costs of a tall building.

[12] We tried alternative regression specifications and found that the resulting indexes show similar patterns, no matter whether or not transaction prices were scaled by the square footage, whether or not they (or the square footage) were logged and which descriptive property characteristics and their interactions were included.

Table 2 ■ Hedonic regression coefficients.

log(sq. footage)	0.61***
	(42.0)
Building Designation (comparison group: Tenement)	
Dwelling	0.46***
	(15.2)
Loft	0.46***
	(11.9)
Other	0.68***
	(17.4)
Construction Material (comparison group: Brick)	
Stone	0.10***
	(4.5)
Other	−0.44***
	(−5.6)
Additional Features	
Store on 1st floor	0.20***
	(7.9)
Basement	−0.19***
	(−3.8)
Number of Stories (comparison group: Six and over)	
1	0.52***
	(7.8)
2	0.05
	(1.0)
3	−0.38***
	(−10.4)
4	−0.21***
	(−6.6)
5	−0.15***
	(−5.3)
Neighborhood (comparison group: Union Square - Lower East Side)	
Central Harlem-Morningside Heights	−0.07*
	(−1.8)
Chelsea-Clinton	0.60***
	(17.0)

Table 2 ■ Continued

Neighborhood (comparison group: Union Square - Lower East Side)	
East Harlem	−0.180***
	(−4.8)
Gramercy Park - Murray Hill	0.66***
	(17.1)
Greenwich Village - Soho	0.21***
	(5.1)
Lower Manhattan	0.59***
	(11.6)
Upper East Side	0.57***
	(14.9)
Upper West Side	0.45***
	(11.4)
Washington Heights - Inwood	0.22***
	(4.5)

***, ** and * represent significance at the 1%, 5%, and 10% levels, respectively. Standard errors are clustered by date and t-statistics are reported in parentheses. Regression R^2 = 45:80%.

Turning to the results for building designation, we find that dwelling, loft and "Other" building types command a premium over tenements, with properties in the "Other" building designation (likely representing office buildings) being the most expensive. With respect to construction material, buildings constructed out of stone and brick were valued higher than buildings constructed from other materials, and stone was slightly preferable to brick. As to additional features, buildings containing a store tended to sell at higher prices. The store premium might be explained by the zoning resolution adopted in New York City in 1916 (and subsequently reversed in 1961), which, among other restrictions, established "residential," "business," and "unrestricted" zones and likely made it difficult to open new stores in residential areas. Buildings with basements commanded lower prices than otherwise similar buildings possibly because basements were more common in older buildings.

We also find that, controlling for the total square footage, one-story buildings commanded a premium over buildings with six stories and up, our comparison group, while three-, four- and five-story buildings sold at a discount. The price premium for buildings six stories and higher can be explained by the higher prevalence of elevators and the fireproofing of these buildings. Real estate builders concluded early on that tenants would not walk more than five floors up, and therefore, buildings six floors and taller would be expected to

have elevators (*e.g.*, Birkmire 1906, Hendrick 1912 and Warren 1915). In non-elevator buildings, space on higher floors rented at a discount. Due to the limited reach of fire ladders, starting from 1885 it was required that all buildings above 75 feet high be fireproofed. An amendment to the Tenement House Law passed in 1909 further demanded that all tenements over five stories high comply with this construction requirement.

The results for neighborhood effects indicate that the areas of Chelsea - Clinton, Grammercy Park - Murray Hill, Greenwich Village - Soho, Lower Manhattan, Upper East and West Sides and Washington Heights - Inwood commanded a premium relative to Union Square - Lower East Side, our comparison group, while Central Harlem-Morningside Heights and East Harlem were considered to be less attractive. Because some of the positive neighborhood effect could be attributed to proximity to the commercial center of Manhattan, we estimated a regression specification that uses the distance from the City Hall (*e.g.*, Margo 1996 and Atack and Margo 1998) rather than the neighborhood dummies. The regression coefficient on the distance variable is negative and highly statistically significant (-0.043 with a t-statistic of -10.16) implying that for each additional mile from City Hall prices fell on otherwise equivalent properties by approximately 4%. However, when the distance variable is used in conjunction with the neighborhood dummies, the effect of distance is entirely subsumed by the dummies, which implies that the Manhattan neighborhood premia of our time period cannot be entirely explained by the proximity to the center. Notably, these different regression specifications produce an almost identical price index.[13]

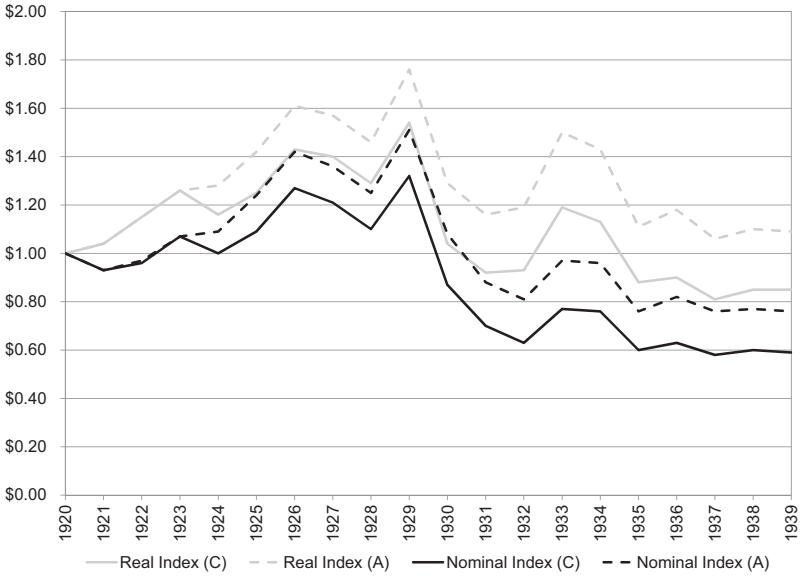
The Indexes

The annual and quarterly, nominal and CPI-adjusted, real estate price indexes constructed with the constant-relative-value and adjacent-period hedonic regression methodologies are plotted in Figure 3. The corresponding index values are reported in Table A1 and Table A2, respectively.[14] It can be seen that the general movements in the indexes are unrelated to the index construction methodology used.

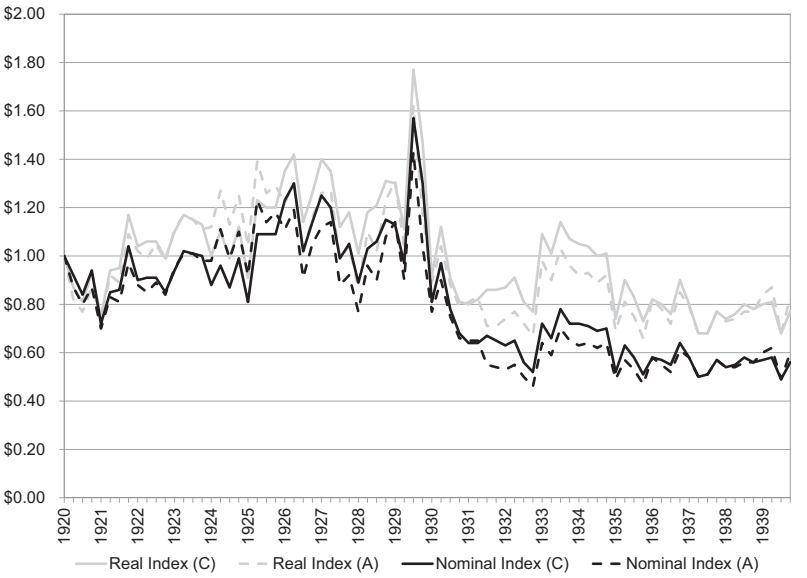
[13]One concern would be that we are missing an important building characteristic, a building's age, which is not available in our dataset. To some extent, the available characteristics, such as the construction material and the number of stories can proxy for age. Moreover, as long as the buildings in our sample reflect the true age distribution throughout the sample period, the resulting index should not be biased by the omission of age.

[14]It is natural to expect that the CPI-adjusted index should exhibit smaller fluctuations than the nominal index, since the CPI basket includes housing costs, and the latter are likely significantly correlated with real estate prices. This pattern can be observed in our plots.

Figure 3 ■ Real estate price indexes.



(a) The Annual Index



(b) The Quarterly Index

Note: The indexes present the real and nominal values of a dollar invested in Manhattan real estate, computed using the constant-relative-value (C) and adjacent-period (A) hedonic regression methodologies.

The indexes show that real estate prices decreased slightly from 1920 Q1 until 1921 Q1, a severe but transitory period of falling prices and output after the First World War. Following a period of high volatility and rising prices, that also coincided with an increase in nationwide construction activity and a real estate bubble in Florida (White 2008), the indexes fall to a local low in 1928 Q1.

After 1926, construction activity in Manhattan and nationwide slowed down (Long Jr. 1936, White 2008 and Hoyt 1933) before rising again during the late 1920s, perhaps because of the increasing reliance on commercial real estate mortgage bonds to finance new construction. Hoyt (1933, p. 265) writes about this time period:

> Cash transactions were becoming less frequent . . . the illusion of the rising markets was sustained by trades of one type of property for another, in which the price was padded by both parties. The high level of values was also supported by first-and second-mortgage loans, so that owners could borrow up to 80% of the peak value of their property . . .

The stock market crashed in the fourth quarter of 1929, and this is when the real estate indexes start to decline, albeit at a slower pace.[15] The constant-relative-value hedonic real estate index declines by only 17% in the fourth quarter of 1929, and the larger price drop occurs in the first quarter of 1930 when the index falls by 38%. The majority of the decline in our quarterly index (or 67%) occurs between 1929 Q3 and 1932 Q4, and from then on, the index rises only by 8% until the end of our sample period in the fourth quarter of 1939 (which amounts to less than 1.1% per year). Interestingly, a temporary increase in the index is observed in the first quarter of 1933, coinciding with the establishment of the HOLC, but this increase is reversed in 1935, concurring with the end of HOLC's lending program.[16] According to our quarterly constant-relative-value hedonic index, the value of $1 invested in the real estate index in the beginning of 1920 would have turned into 56 cents in nominal terms or 77 cents when expressed in 1920 dollars (according to the annual index, these numbers are 59 cents and 85 cents, respectively).

[15]A review of real estate activity in the *Real Estate Record and Builders' Guide* on January 4th, 1930, reads: "despite the Wall Street upheaval in the Autumn of 1929, general activity of the Manhattan market was not noticeably depressed."

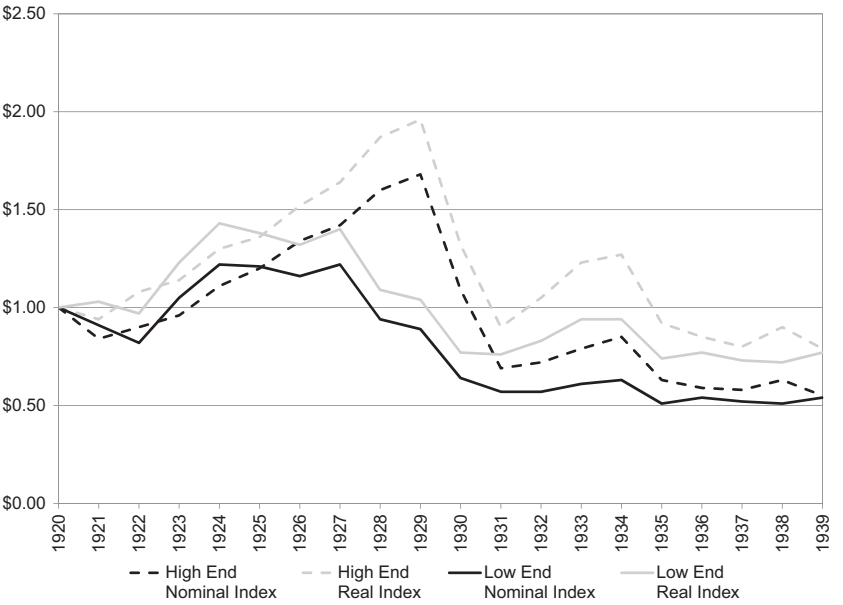
[16]Though HOLC loans were designated for homes worth less than $20,000 and likely not available for the vast majority of the Manhattan real estate, the program helped lending banks recover some of the potential losses and likely, at least temporarily, raised the sentiment about the future of real estate investments.

Our data and analysis also elaborate on two further characteristics of the real estate cycle. First, in an unreported regression, we account for the price effect of foreclosures by including a foreclosure dummy in Equation (1). Campbell, Gigilo and Pathak (2011) show that foreclosures, by forcing a house to be sold quickly, reduce the price by, on average, 27%. Since in the early 1930s the number of foreclosures rose, we check whether the foreclosure dummy can explain the price decrease we observe. It does absorb some of the price drop during 1930 Q1 to 1935 Q1, when the number of foreclosures was high. The coefficients on the foreclosure dummy for both CPI-adjusted and nominal sale prices are −0.30 (which is highly statistically significant with the *t*-statistic of −8.13), implying that foreclosures reduced the sale price by 26% in our sample. However, including the foreclosure dummy does not affect the ultimate decline in the indexes, which come out almost identical to the indexes constructed without the dummy for the remainder of the sample period.[17]

Our price indexes can be compared to those available in the existing literature. Shiller (2005) presents a real estate index for the time period that overlaps with ours. Unlike our index, his index is nation-wide and constructed only for single-family homes. Additionally, it does not use exclusively transaction-based prices but also relies on a 1934 survey which asked owners what their homes were currently worth and the initial purchase price that they paid. However, its general patterns are consistent with our index. The Shiller index also shows a price increase in the early 1920s and a drop in the early 1930s. The only difference is that his index shows another increase by 1940 whereas ours remains flat. Wheaton, Baranski and Templeton (2009) compute a decade-interval inflation-adjusted index of commercial real estate property values in Manhattan, using the repeat sales methodology. Consistent with our findings, they document a rise in real estate prices between 1919 and 1929 and a large drop between 1929 and 1939, such that the 1939 prices they observe are lower than the 1919 prices. Goetzmann and Newman (2009) present an index of real estate bond prices and document a roughly 75% price drop from the peak in May 1928 to a low in April 1933. The magnitude of the decline is very similar to ours, but one difference is that our Manhattan real estate price index peaks later, in the third quarter of 1929, coinciding with the stock market peak.

[17]In down markets, houses are frequently sold at prices that are either above or below their fundamental values. The fire-sale aspect of foreclosures puts a downward pressure on transaction prices. However, when owners have the luxury of waiting for a better offer, they may be reluctant to sell a lower price than the price they had initially paid due to the disposition effect (*e.g.*, Genesove and Mayer 2001), which would bias up the market prices.

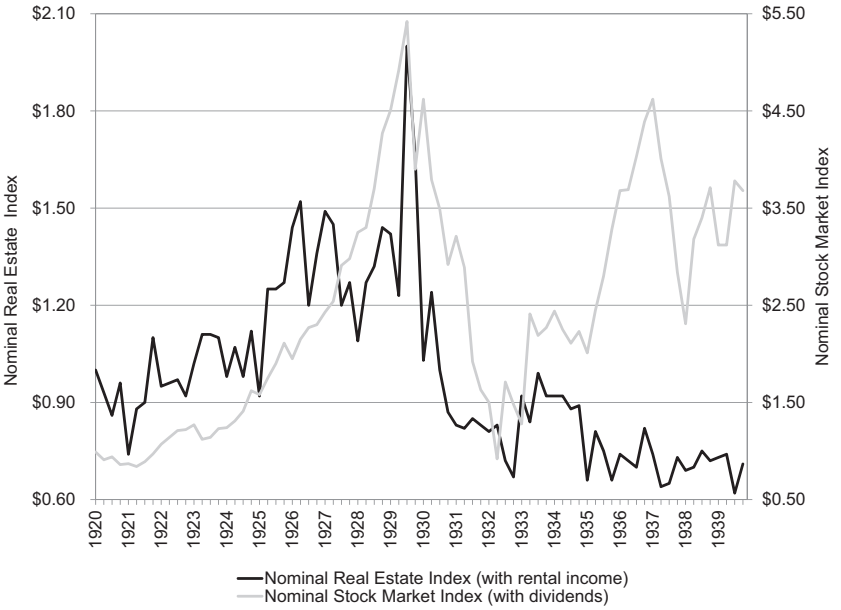
Figure 4 ■ Real estate price indexes: High-End Low-End.



Note: The indexes present the real and nominal values of a dollar invested in a Manhattan high-end low-end real estate indexes, computed using constant-relative-value hedonic regression methodology. High-end properties consist of dwellings in Chelsea - Clinton, Gramercy Park - Murray Hill, Upper East Side and Upper West Side. Low-end properties consist of tenements in Union Square - Lower East Side, Central Harlem-Morningside Heights and East Harlem.

Figure 4 and the corresponding Table A3 present indexes computed separately for high- and low-end properties. While an article in the *New York Times* on June 14, 1928, asserted: "it is generally conceded that when the stock market is booming, the realty market suffers," our evidence indicates that the price of high-end properties co-moved considerably more with the stock market than low-end properties between 1929 and 1932. This correlation makes sense from the standpoint that high-end properties were located in areas where a large portion of income was produced on Wall Street. It is also consistent with Ait-Sahalia, Parker and Yogo (2004) who find a significant correlation during the late 1980s and 1990s between the rents of luxury Manhattan co-ops and equity returns as households responded to stock market driven changes in their wealth. Despite the lack of a significant run-up in the 1920s, the low-end index was not immune to the price decline, which, in fact, preceded the decline of the high-end index. Both indexes earned a similar return over our sample period.

Figure 5 ■ Real estate and market indexes.



Note: The indexes assume that investment proceeds (dividends or net rental income) are reinvested back into the index.

Comparison with the Stock Market Index

To further elaborate on real estate and stock market cycles during the 1920s and 1930s, Figure 5 plots market and real estate indexes. In order to make a fair comparison to the stock market index, which includes dividend distributions, the nominal real estate index plotted includes not only changes in property values, as in the earlier figures, but also net rental income earned. Net rental income is computed as rental income net of taxes, operating costs and capital expenditures.[18] Operating costs include items such as management

[18]We estimated net income as follows. We used the data on gross income, real estate taxes and operating expenses for the years 1928 to 1935, provided by Burton and Burton (1937), who surveyed 54 income-producing properties in Manhattan. Having computed the ratios of these items to the assessed price in 1930, provided by the authors, we estimated these numbers as a fraction of the market value of the property using our price appreciation index for the sample period of the survey. For years that lie outside of the survey time period, we used the ratios for the survey end points (*i.e.*, we used the 1928 ratio for the period 1920–1927 and the 1935 ratio for the period 1936–1939). The survey does not provide an estimate for depreciation, but Bolton (1922) estimates that most buildings would not last over 50 years without a total capital expenditure equal to the initial construction cost, implying a 2% per year average capital expenditure.

costs, cleaning, upkeep, water service, heat and public lights, but not capital expenditures.[19]

It is not surprising that the nominal real estate index with an adjustment for net rental income has a higher total return than the one that does not make the adjustment. According to our estimates, net rental income provided an additional return of 2.5% up until 1929. Since rental revenues did not fall drastically, but rather declined gradually following the 1929 drop in real estate prices, net rental revenues rose to almost 6% of the market value of a property in the early 1930s but eventually fell to a −1.3% in 1935. The reason why net income declined to a negative number is because gross rental revenues fell dramatically starting in 1930 but taxes and operating expenses remained steady.

Indeed, in our sample, the assessed real estate values, computed for tax purposes, hardly moved, while transaction prices plummeted. Having started roughly equal to the market price, the ratio of the assessed value to price rose as prices started to fall, reaching a peak of 359% for a median house in August 1931. The reluctance to lower assessed values in response to falling prices can be explained—Burton and Burton (1937) calculate that about 65% of the city's revenues consistently came from real estate taxes. This drastic reduction in the profitability of the real estate business during the Great Depression is also noted by Hoyt (1933) and Grebler (1955).

A comparison of the stock market and real estate indexes shows that Manhattan real estate prices similarly reached a peak in 1929 Q3 and the real estate downturn coincided with the stock market crash. But while the stock market index started rebounding in 1932, the real estate index (despite experiencing a small rebound during the fourth quarter of 1933) fell back to its pre-rebound level during the fourth quarter of 1934.[20]

Why did the real estate index stay down despite improving economic conditions in the mid to late 1930s? One reason is an oversupply of real estate during that time period. The building frenzy in the 1920s significantly added to supply. Many businesses and hotels went bankrupt. Families moved in together in order to save on living expenses. According to *An Analysis of Competitive Office Space in Manhattan* produced by the Real Estate Board of New York,

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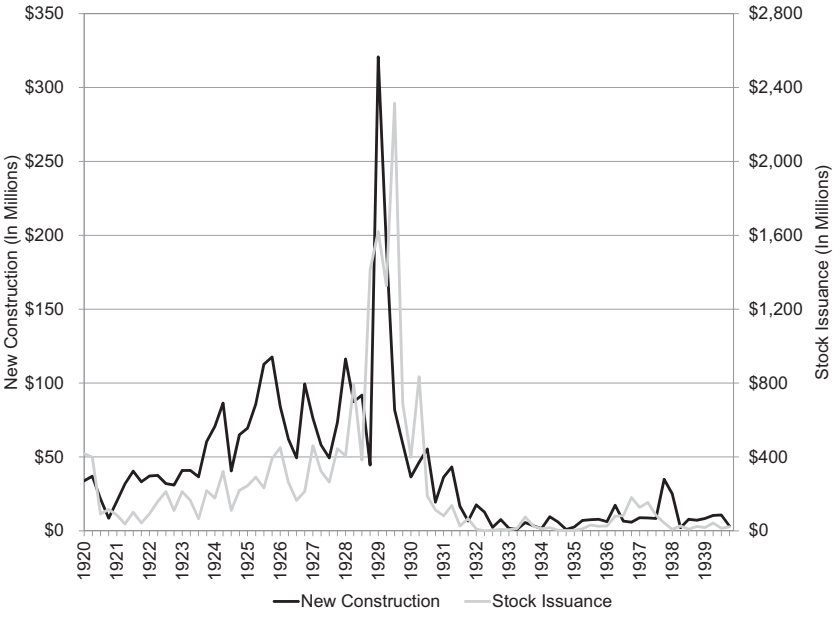
Notwithstanding he argues that the economic life of a building is much shorter than the physical life due to changing fashions and technical innovations that shift the demand towards new construction, we used a conservative estimate of depreciation of 2% a year.

[19]Table 2 of Bolton (1922) provides a detailed description of the various expenses.

[20]Hoyt (1933) also observes that there was a short-lived rebound in the Chicago real estate prices in the early 1930s that later reverted.

Figure 6 ■ New stock issuance and Manhattan construction activity.



Note: The series are new construction plans for Manhattan and new share issuance activity.

the vacancy rate for office space in Manhattan was 24% in 1934. Grebler (1955) estimates, based primarily on properties located in Manhattan, that in 1933 the vacancy rate for walk-up apartment houses was 22%; for elevator apartment houses it was 15%; and for loft buildings it was 23%. The large supply of real estate space in Manhattan led to a much delayed price response to the eventual rise in demand, thereby leading to a long cycle in real estate prices.

From Figure 6, it can be seen that peaks and troughs of the real estate and market indexes shown in Figure 5 coincide with movements in new construction (estimated based on construction permits issued) and new share issuance by firms, confirming their plausibility.[21] It appears that builders and firms likewise were eager to take advantage of favorable market prices during the late 1920s by increasing the supply of real estate and shares, respectively. However, after the sharp fall in prices, new construction activity and new share

[21]New construction activity for 1929 may be overstated. According to Long Jr. (1936) the Multiple Dwelling Law that gave a tax break for residential buildings caused a rush for permits in the early months of the year. He claims that the numbers for new buildings in 1929 should be reduced by 228 million to bring them in line with the estimates with the previous years (fn. 4, p. 183).

issuance experienced a sharp decline. Based on 10,351 building permits we accessed at the Office for Metropolitan History, the median nominal cost of a new construction fell from $65,000 during the 1920s to $7,500 during the 1930s.

The effect of these supply and demand factors is particularly noticeable in the context of overall returns. Our indexes reveal that if all rental income was reinvested back into the Manhattan real estate market, an investor who had invested $1 in the beginning of 1920 would have been left with 71 cents at the end of 1939. In comparison, a dollar invested in the stock market, with all dividend payments reinvested back, would have generated $3.68 in the same time period.

A downturn and protracted recovery of this sort meant potentially great losses for mortgage originators.[22] In a January 6, 1934, report the *Real Estate Record and Builders' Guide* calculated that in 1932 and 1933 lending institutions in Manhattan repossessed properties with an assessed value of $238.8 million.

Conclusion

This paper has presented new data on real estate prices in Manhattan, one of the most significant markets in the United States. We have attempted to address a general paucity of information on historical real estate markets, which has limited our ability to understand movements in real estate prices during one of the most significant crises in U.S. history. We hope that our indexes for Manhattan will be useful for other researchers analyzing real estate dynamics at this time, following Ghent (2011) who uses changes in our nominal index to predict whether mortgage lenders renegotiated the terms of their loans in the New York City metropolitan area during the 1920s and 1930s.

We have shown that the real estate market crashed suddenly and its decline lasted all through the 1930s, in contrast to the stock market which recovered from 1933 until the recession of 1937 to 1938. The decline in real estate prices in Manhattan that we observe was associated with a halt in new construction activity and a sharp rise in foreclosures. We have shown that real estate cash flows rapidly turned negative because expenses remained fairly constant (*i.e.*, taxes, maintenance and capital expenditures) while rental income earned was

[22]Investigating the relatively recent Savings and Loans Crisis, Case (1991) provides evidence that banks suffered significant losses during the real estate market downturn in Massachusetts between 1987 and 1991.

highly volatile. Contributing to the slow recovery was an oversupply of available housing through the pre-crash construction boom and a large number of foreclosures and vacancies in the early 1930s. Even when demand for real estate eventually rose, it was reflected in market prices only with a substantial delay, reflecting a long cycle in real estate prices.

How long did Manhattan real estate prices take to recover? According to the Annual Report on the NYC Property Tax for the fiscal year 2000, the full recovery did not happen until 1960. The report states: "Manhattan assessments grew by only $134.8 million between 1940 and 1950, or 1.7%; it was not until 1960 that assessments in Manhattan exceeded their pre-Depression level." Thus, a property owner who would have invested on the eve of the Great Depression would not have recovered the full value of their investment until four decades later. Consistent with evidence presented in Reinhart and Rogoff (2009), our evidence on Manhattan indicates that real estate cycles are much longer than stock market cycles.

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Appendix

Table A1 ■ Hedonic regression index values.

Panel A: Quarterly Index

Date	Real Index	Nominal Index	Date	Real Index	Nominal Index
1920Q1	$1.00	$1.00	1930Q1	$0.92	$0.81
1920Q2	$0.87	$0.92	1930Q2	$1.12	$0.97
1920Q3	$0.81	$0.84	1930Q3	$0.91	$0.78
1920Q4	$0.93	$0.94	1930Q4	$0.81	$0.68
1921Q1	$0.75	$0.72	1931Q1	$0.80	$0.64
1921Q2	$0.94	$0.85	1931Q2	$0.82	$0.64
1921Q3	$0.95	$0.86	1931Q3	$0.86	$0.67
1921Q4	$1.17	$1.04	1931Q4	$0.86	$0.65
1922Q1	$1.04	$0.90	1932Q1	$0.87	$0.63
1922Q2	$1.06	$0.91	1932Q2	$0.91	$0.65

Table A1 ■ Continued

Panel A: Quarterly Index

Date	Real Index	Nominal Index	Date	Real Index	Nominal Index
1922Q3	$1.06	$0.91	1932Q3	$0.81	$0.56
1922Q4	$0.99	$0.85	1932Q4	$0.77	$0.52
1923Q1	$1.10	$0.94	1933Q1	$1.09	$0.72
1923Q2	$1.17	$1.02	1933Q2	$1.01	$0.66
1923Q3	$1.15	$1.01	1933Q3	$1.14	$0.78
1923Q4	$1.13	$1.00	1933Q4	$1.07	$0.72
1924Q1	$1.00	$0.88	1934Q1	$1.05	$0.72
1924Q2	$1.10	$0.96	1934Q2	$1.04	$0.71
1924Q3	$0.99	$0.87	1934Q3	$1.00	$0.69
1924Q4	$1.12	$0.99	1934Q4	$1.01	$0.70
1925Q1	$0.91	$0.81	1935Q1	$0.74	$0.52
1925Q2	$1.23	$1.09	1935Q2	$0.90	$0.63
1925Q3	$1.20	$1.09	1935Q3	$0.83	$0.58
1925Q4	$1.20	$1.09	1935Q4	$0.73	$0.51
1926Q1	$1.35	$1.23	1936Q1	$0.82	$0.58
1926Q2	$1.42	$1.30	1936Q2	$0.80	$0.57
1926Q3	$1.14	$1.02	1936Q3	$0.76	$0.55
1926Q4	$1.26	$1.14	1936Q4	$0.90	$0.64
1927Q1	$1.40	$1.25	1937Q1	$0.80	$0.58
1927Q2	$1.35	$1.20	1937Q2	$0.68	$0.50
1927Q3	$1.12	$0.99	1937Q3	$0.68	$0.51
1927Q4	$1.18	$1.05	1937Q4	$0.77	$0.57
1928Q1	$1.01	$0.89	1938Q1	$0.74	$0.54
1928Q2	$1.18	$1.03	1938Q2	$0.76	$0.55
1928Q3	$1.21	$1.06	1938Q3	$0.80	$0.58
1928Q4	$1.31	$1.15	1938Q4	$0.78	$0.56
1929Q1	$1.30	$1.13	1939Q1	$0.80	$0.57
1929Q2	$1.11	$0.97	1939Q2	$0.81	$0.58
1929Q3	$1.77	$1.57	1939Q3	$0.68	$0.49
1929Q4	$1.47	$1.30	1939Q4	$0.77	$0.56

Panel B: Annual Index

Date	Real Index	Nominal Index
1920	$1.00	$1.00
1921	$1.04	$0.93
1922	$1.15	$0.96
1923	$1.26	$1.07
1924	$1.16	$1.00
1925	$1.25	$1.09
1926	$1.43	$1.27
1927	$1.40	$1.21

Table A1 ■ Continued

Panel B: Annual Index

Date	Real Index	Nominal Index
1928	$1.29	$1.10
1929	$1.54	$1.32
1930	$1.04	$0.87
1931	$0.92	$0.70
1932	$0.93	$0.63
1933	$1.19	$0.77
1934	$1.13	$0.76
1935	$0.88	$0.60
1936	$0.90	$0.63
1937	$0.81	$0.58
1938	$0.85	$0.60
1939	$0.85	$0.59

Note: This table presents the values of a $1 investment in the real estate index computed using the constant-relative-value hedonic methodology.

Table A2 ■ Adjacent-period hedonic regression quarterly index values.

Panel A: Quarterly Index

Date	Real Index	Nominal Index	Date	Real Index	Nominal Index
1920Q1	$1.00	$1.00	1930Q1	$0.89	$0.77
1920Q2	$0.82	$0.87	1930Q2	$1.04	$0.90
1920Q3	$0.77	$0.80	1930Q3	$0.88	$0.75
1920Q4	$0.87	$0.87	1930Q4	$0.79	$0.66
1921Q1	$0.74	$0.70	1931Q1	$0.81	$0.65
1921Q2	$0.92	$0.83	1931Q2	$0.83	$0.65
1921Q3	$0.89	$0.81	1931Q3	$0.71	$0.55
1921Q4	$1.09	$0.97	1931Q4	$0.71	$0.54
1922Q1	$1.02	$0.88	1932Q1	$0.74	$0.53
1922Q2	$0.99	$0.85	1932Q2	$0.77	$0.55
1922Q3	$1.05	$0.89	1932Q3	$0.72	$0.50
1922Q4	$0.98	$0.84	1932Q4	$0.67	$0.46
1923Q1	$1.11	$0.95	1933Q1	$0.98	$0.64
1923Q2	$1.17	$1.01	1933Q2	$0.90	$0.59
1923Q3	$1.15	$1.01	1933Q3	$1.03	$0.70
1923Q4	$1.11	$0.98	1933Q4	$0.96	$0.65
1924Q1	$1.12	$0.98	1934Q1	$0.92	$0.63
1924Q2	$1.27	$1.11	1934Q2	$0.93	$0.64
1924Q3	$1.13	$0.99	1934Q3	$0.89	$0.62
1924Q4	$1.25	$1.10	1934Q4	$0.92	$0.64
1925Q1	$1.04	$0.92	1935Q1	$0.69	$0.49

Table A2 ■ Continued

Panel A: Quarterly Index

Date	Real Index	Nominal Index	Date	Real Index	Nominal Index
1925Q2	$1.39	$1.23	1935Q2	$0.81	$0.57
1925Q3	$1.26	$1.14	1935Q3	$0.75	$0.53
1925Q4	$1.29	$1.18	1935Q4	$0.66	$0.47
1926Q1	$1.22	$1.11	1936Q1	$0.82	$0.58
1926Q2	$1.30	$1.19	1936Q2	$0.78	$0.55
1926Q3	$1.01	$0.91	1936Q3	$0.72	$0.52
1926Q4	$1.16	$1.05	1936Q4	$0.85	$0.61
1927Q1	$1.26	$1.12	1937Q1	$0.79	$0.58
1927Q2	$1.27	$1.14	1937Q2	$0.68	$0.50
1927Q3	$0.99	$0.88	1937Q3	$0.68	$0.51
1927Q4	$1.04	$0.92	1937Q4	$0.77	$0.57
1928Q1	$0.87	$0.77	1938Q1	$0.73	$0.54
1928Q2	$1.10	$0.96	1938Q2	$0.74	$0.54
1928Q3	$1.02	$0.90	1938Q3	$0.77	$0.56
1928Q4	$1.23	$1.08	1938Q4	$0.77	$0.56
1929Q1	$1.31	$1.14	1939Q1	$0.84	$0.60
1929Q2	$1.03	$0.90	1939Q2	$0.87	$0.62
1929Q3	$1.62	$1.43	1939Q3	$0.68	$0.49
1929Q4	$1.18	$1.04	1939Q4	$0.83	$0.60

Panel B: Annual Index

Date	Real Index	Nominal Index
1920	$1.00	$1.00
1921	$1.04	$0.93
1920	$1.00	$1.00
1921	$1.04	$0.93
1922	$1.15	$0.97
1923	$1.26	$1.07
1924	$1.28	$1.09
1925	$1.42	$1.24
1926	$1.61	$1.42
1927	$1.57	$1.36
1928	$1.46	$1.25
1929	$1.76	$1.51
1930	$1.29	$1.08
1931	$1.16	$0.88
1932	$1.19	$0.81
1933	$1.50	$0.97
1934	$1.43	$0.96
1935	$1.11	$0.76

Table A2 ■ Continued

Panel B: Annual Index		
Date	Real Index	Nominal Index
1936	$1.18	$0.82
1937	$1.06	$0.76
1938	$1.10	$0.77
1939	$1.09	$0.76

Note: This table presents the values of a $1 investment in the real estate index, computed using the adjacent-period hedonic methodology.

Table A3. Hedonic regression high- and low-end indexes.

	Low-End		High-End	
Date	Real Index	Nominal Index	Real Index	Nominal Index
1920	$1.00	$1.00	$1.00	$1.00
1921	$1.03	$0.91	$0.94	$0.84
1922	$0.97	$0.82	$1.08	$0.90
1923	$1.23	$1.05	$1.14	$0.96
1924	$1.43	$1.22	$1.30	$1.11
1925	$1.38	$1.21	$1.36	$1.20
1926	$1.32	$1.16	$1.52	$1.34
1927	$1.40	$1.22	$1.64	$1.42
1928	$1.09	$0.94	$1.87	$1.60
1929	$1.04	$0.89	$1.96	$1.68
1930	$0.77	$0.64	$1.32	$1.09
1931	$0.76	$0.57	$0.90	$0.69
1932	$0.83	$0.57	$1.05	$0.72
1933	$0.94	$0.61	$1.23	$0.79
1934	$0.94	$0.63	$1.27	$0.85
1935	$0.74	$0.51	$0.92	$0.63
1936	$0.77	$0.54	$0.85	$0.59
1937	$0.73	$0.52	$0.80	$0.58
1938	$0.72	$0.51	$0.90	$0.63
1939	$0.77	$0.54	$0.79	$0.55

Note: This table presents the values of a $1 investment in the high- and low-end real estate properties using the constant-relative-value hedonic methodology. High-end properties consist of dwellings in Chelsea - Clinton, Gramercy Park - Murray Hill, Upper East Side and Upper West Side. Low-end properties consist of tenements in Union Square - Lower East Side, Central Harlem-Morningside Heights and East Harlem.