



Prepared for

**Homer Hoyt Advanced Studies Institute, Weimer School
of Advanced Studies in Real Estate and Land Economics,
and Hoyt Fellows**

Prepared by

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S&P/GRA Commercial Real Estate Indices (SPCREX™)

- “Commercial real estate synthetics will allow structured trades and positions between indices and contracts, providing a plethora of alternative risk-return combinations -- currently not available in the global capital markets.”
- “As demand for real estate synthetics rise, the size of the market will be compelling.....driving retail and institutional capital flows to meet portfolio insurance and yield enhancement needs.”

**Lawrence Souza, Managing Director-
Real Estate Investment and Research,
Charles Schwab Investment
Management (CSIM)**

SPCREX™ Index Development

S&P/GRA Commercial Real Estate Indices (SPCREX™)

Ten indices based on property sector and geographic region:

- | | | |
|-----|-----------------------------------|-----------------------------------|
| 1) | National (NCI) | Composite |
| 2) | Office (OCI) | |
| 3) | Warehouse (WCI) | |
| 4) | Apartment (ACI) | |
| 5) | Retail (RCI) | |
| 6) | Northeast (NEI) | Four Core Property Sectors |
| 7) | Midwest (MID) | |
| 8) | Mid-Atlantic South (MAS) | |
| 9) | Pacific West (PCW) | |
| 10) | Desert Mountain West (DMW) | |
| | | Five Geographic Regions |

SPCREX™ Research and Development

Introduction

Goals:

- Develop Pure-Price Commercial Real Estate Indices based on closed transactions at the National, Regional and Sector Level.
- Provide industry with tradable indices used to trade commercial real estate backed derivative products.
- Control for data spikes while allowing indices to reflect underlying real estate investment and space market fundamentals (random walk).

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Market Size

Size of Commercial Real Estate Capital Markets:

Global Direct: \$15 trillion

U.S. Direct: \$5.3 trillion (w/Hotels) - \$100 bill. On side-lines

REITs: \$330 billion (Equity) – 19% per year growth

CMBS: \$170 billion Annual Issuance – 24% per year growth

Bank Loans: \$1.8 trillion Annual Origination (Commercial)

Derivatives: \$5.4 trillion – Commodity – 52% per year growth

RE Derivatives: \$53-to-\$106 billion in 3-to-5 years (projected)

GRA Commercial Real Estate Indices (CREX™)

Users of Derivative Contracts

Institutional and Retail:

- Institutional Investors – Pension and hedge fund exposure to commercial real estate.
- Lenders – Insurance companies and commercial banks “downside” protection.
- Foreign Investors – Easy access and exposure to U.S. commercial real estate market.
- Real Estate Portfolio Managers – Hedge/yield enhancement by sector and geography.
- Speculators – Real estate developer hedge by period, product type and geography.
- High Net Worth Individuals – Personal portfolio insurance and yield enhancement by property type and geography.

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Strategic Partnerships

Benefits of Business Relationships:

Standard & Poor's (S&P):

- Wall Street Investment Banking Community
- Branding/Marketing Channels/IT-Index Infrastructure

Chicago Mercantile Exchange (CME):

- Inter-Dealer Broker Distribution Network (GlobeX)
- Branding/Marketing Channels

GRA/Charles Schwab (CSIM):

- Main Street Real Estate Investment Community
- Retail/Financial Planner Distribution Network
- Branding/Marketing Channels/IT-Index Infrastructure

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Index History

Tradable and non-tradable indexes ...

- Global Real Analytics LLC (GRA) ...
 - Has published the National Real Estate Index (NREI) since 1985
 - Represents a family of proprietary indexes representing commercial property values, rental rates, and cap rates in 60 local markets
 - Indexes published quarterly
- GRA/S&P Commercial Real Estate Indexes (GRA SPCREX™ Indexes) ...
 - Represent “tradable” indexes depicting trends in commercial real estate values
 - Published monthly and designed to serve as subject for exchange traded and OTC derivative products

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Transaction Data

- Over 240,000 historical transactions in system
- 4,500 to 5,000 transactions processed monthly
 - Average closed transactions per 3-month period:
 - 700 per sector
 - 500 per region
- Transaction Volume: Roughly 48% National
 - \$170 billion per year
 - 1.2 billion square feet per year

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Transaction Data: Primary Sources

- Leading Transaction Data Providers
- Major Commercial Brokerage Firms
- Appraisers/Mortgage Bankers
- 10K/10Q Reports (REITs/REOCs)
- Real Estate Publications
- Multiple Listing Services (MLS)
- Title Insurance Company Plant Reports
- Other Real Estate Related Websites

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Property Sector Transactions

- **Includes**: Core Property Types

- Buildings greater than 20,000 square feet Office, Warehouse, and Apartments, and greater than 10,000 square feet Retail
- CBD/Suburban Office, Warehouse, Garden & Mid/High Rise Apartments, Groc/Drug Anchored Ctrs, Regional Malls, etc.

- **Excludes**: Specialized Property Types

- Mixed-use, Banks, Gas Stations, Entertainment, Medical Office, Manufacturing, Town-Homes, Student and Subsidized Housing, Condos, Hospitals, Education, Parking, Call Centers

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Data Collection Process

- Published number *three month rolling* with a *three month lag*.

Download Date	Published Number									Posted	
	June	July	August	Sept	Oct	Nov	Dec	Jan	Feb	March	2nd Last Tuesday Month
1-Aug											
1-Sep											
1-Oct											
1-Nov											
1-Dec											
1-Jan											
1-Feb											
1-Mar											
1-Apr											

Release	Majority of Sale Closing Prices
2 nd to last Tuesday of ... January	August, September, October
February	September, October, November
March	October, November, December
April	November, December, January

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Regional Markets



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Sub-Regional Markets

Metro Groups (10)

- NEI: New York-Boston
- NEI: Washington D.C.-Baltimore-Richmond-Philadelphia
- MID: Chicago
- MID: Cincinnati-Cleveland-Columbus-Detroit-Kansas City
- MAS: Atlanta-Charlotte-Raleigh-Durham-Memphis-Nashville
- MAS: Miami-Ft. Lauderdale-Jacksonville-Orlando-Tampa-St. Petersburg
- DMW: Phoenix-Tucson-Las Vegas-Denver
- PCW: Los Angeles-Inland Empire-San Diego
- PCW: San Francisco-Oakland-San Jose-Sacramento
- PCW: Seattle-Portland

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Regional Markets

Broad-Based Target Markets

- Commercial stock and market activity
- Population size/growth trends
- Demographic composition/trends
- Regional/inter-regional economic-geographic correlations

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Metro-Group Property Sector Matrix

Metro Group - Property Sector Matrix

		Regional Indices										
		Northeast		Mid-Atlantic South		Mid-West		Pacific West		Desert	National	
National		NE-Bos	NE-Other	MAS-Atl	MAS-Fl	MW-Chic	MW-Oth	PW-PNW	PW-NorCal	PW-SoCal	DesMtn	National
Apartment	P*Q											Apartment
Office	P*Q											Office
Retail	P*Q											Retail
Warehouse	P*Q											Warehouse
											National	
											Sector Indices	

Note: The matrix includes arrows indicating relationships between the 'National' row and the 'Sector Indices' column, and between the 'Apartment' row and the 'National' column.

Note: **P*Q** is the **Aggregate Value** for the Sector-Metro Group. Where: P is the property type (constant quality- adjusted) weighted average price per square foot for the sector-metro group; and Q is the total square feet in inventory (stock) for the sector-metro group.

Index Calculation: National & Regional Geographic Composite Indices

Approach: Standard & Poor's

- Market capitalization (“cap weighted”) price index.
- Cap weighted index calculations using divisors.
- Gives each geographic market and property sector a weight based on size and value of existing commercial real estate stock (or total inventory).

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Index Calculation

National and Regional Geographic Composite Indices:

- Market Capitalization (“cap weighted”) Price Index Methodology

$$Index_{\sum US t+1} = \left\{ \frac{\sum (P_{SMt+1} * S_{SMt})}{\sum (P'_{SMt} S_{SMt})} \right\} * 100$$

Where:

Aggregate Values

Divisor

$Index_{\sum US t+1}$ is the national composite index.

P_{SMt+1} average (weighted) price per square foot sector-metro-group (constant quality).

P'_{SMt} average price per square foot sector-metro-group base period (Dec. 01).

S_{SMt} constant weighting factor square feet stock-inventory sector-metro-group reference year (2005).

$\sum(P_{SMt+1} * S_{SMt})$ sum all property sector-metro-group weighted market caps current period.

$\sum(P'_{SMt} * S_{SMt})$ is the *Divisor*.

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Property Sector Classifications

- 20 years of experience
- Over 200 property type-sector classifications (51 used in CREX)
- *Refined* coding utilized to determine **SPCREX™**, excludes specialized property types that lie outside *core* property sector definitions

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Property Class Stratified Weights

Constant Quality Stratified Weights (CQSW):

- Property Type Weighting Methodology

$$CQSW_p = (\sum PT-SQF_{t=10}) / (\sum \sum PS-SQF_{t=10})$$

Where $CQSW_p$ is derived by:

- 1) Sum of transactions volume in square feet over a 10 year period by property type within the sector at metro-group level ($PT-SQF_{t=10}$).
- 2) Divided by the sum of all transactions volume in square feet for the sector at the metro-group level ($\sum \sum PS-SQF_{t=10}$).

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Property Class Stratified Weights

Constant Quality-Adjusted Weighted Average Price Per Square Foot:

$$CQWAP_t = \sum (PT_{t=n} * CQSW_t)$$

Where $CQWAP_t$ is derived by:

- 1) Property type average price per square foot at the metro-group level in the current period ($PT_{t=n}$).
- 2) Multiplied by the base period constant quality (property type) stratified weight ($CQSW_t$).

Note: CQWAP is the sector-metro-group weighted average price per square foot that is then applied to McGraw Hill property sector stock weights (square feet) to derive aggregate values for index construction.

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Log Transformation/Filters

Goal: Metro-property type-sector level elimination (filtering) of transaction data (price outliers) above and below two standard deviations from mean. Focus on core transactions.

Log Base 10 Transformations

- **Log sales prices per square foot**
- **Normalize data**
- **Elimination of prices above below 2Stdev from mean (filter)**
- **Transform back to original state**
- **Add to metro-group property type sector for calculation**

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Setting Minimum Transaction Counts

Goal: Eliminate noise in data due to sample size error, at metro-group property type level. Maintain responsiveness to changes in market.

Statistical Precision Formula for Minimum Transaction Counts

$$n = \left(\frac{t \cdot s}{r \cdot p} \right)^2$$

Where:

n = Minimum Sample Size (Transaction Counts) Required at Property Type Level

p = Mean Sales Price Per Square Foot (3-Month Moving Average)

r = Acceptable Price Distance between Sample-and-True Mean Price (15%)

t = Student t – Statistical confidence level (e.g. for 95%, confidence, $t = 1.8$)

s = Mean Sales Price Per Square Foot Standard Deviation (3-Month Rolling)²⁴

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Price Carry-Over

Price Carry-Over Procedure – Property Type-Metro Group Level

- If net positive, no action.
- If **net negative**:
 - 1) Take mean price from prior period,
 - 2) Carry forward to current period,
 - 3) Replicate until minimum transaction count met,
 - 4) Calculate mean price per square foot for current period.

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Stock-Inventory Weights

Commercial-Stock Inventory Weighting Methodology:

- Commercial Stock Data (Update Every 5 Years):
 - Source McGraw-Hill/F.W. Dodge Analytics
 - Only/Most respectable source of commercial stock data
 - Creates and updates results from Building Stock Database
 - Point-in-time stock estimates cover completed square footage and estimated rates of net demolition/conversions.
 - Average net removal rates of 1.3% per year are applied to all regions and nonresidential structures, and 0.7% per year for multifamily.

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Stock-Inventory Weights

Commercial-Stock Inventory Weight:

- Implicit Market Value Weighting Methodology

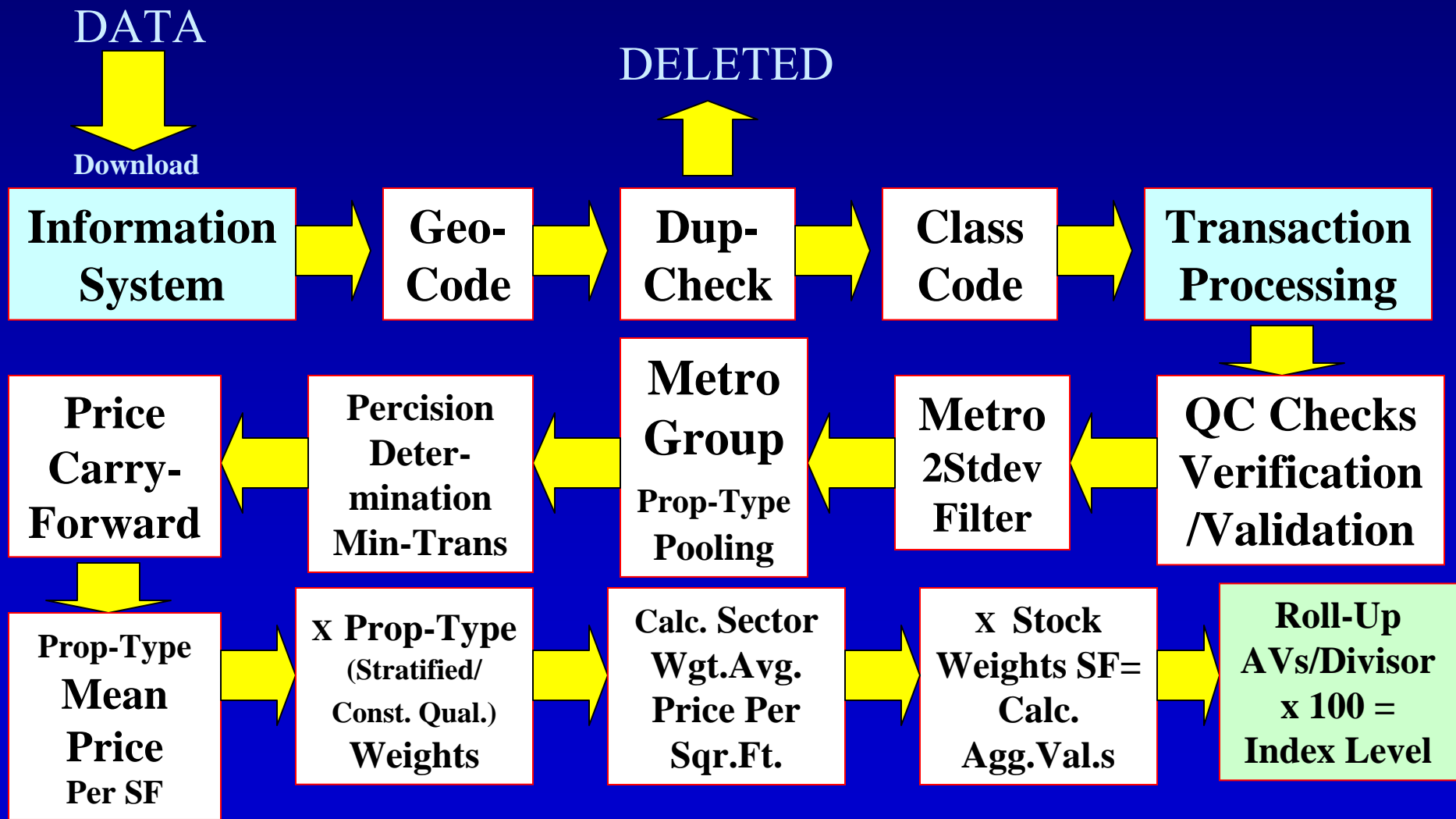
$$MVW_t = (P_{SMt+1} * S_{SMt}) / \sum (P_{SMt+1} * S_{SMt})$$

Where MVW_t is derived by:

- 1) Multiplying the metro group's reference year's (t) stock-inventory in square feet (S_{SMt})
- 2) By the current period's (t+1) average price per square foot (P_{SMt+1})
- 3) Divided by the sum of all aggregate market values for the region or nation.

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CREX Index Process Review



Derivative Contract - Example

CREX™ Index

Contract Construction

CME U.S. Commercial Real Estate Futures and Options

	Futures	Options on Futures
Contract Size	\$250 x Index, e.g., if SPCREX™ Index @ 150.00 then contract value equals \$37,500 (= \$250 x 150.00)	One (1) futures contract
Tick Size	0.20 index points (\$50.00)	0.10 index points (\$25.00)
Trading Hours	Offered on CME Globex Sundays-Thursdays, 5:00 p.m.-3:00 p.m. (central) the following day	
Months	First 20 contracts in quarterly cycle of March, June, September and December	
Final Settlement Date	Trading in expiring contract ceases at the close of trading on the business day prior to the 2 nd to last Tuesday of contract month; index data released at 9:15 a.m. (CT) on 2 nd to last Tuesday of contract month	
Cash Settlement	Cash settled on Commercial Real Estate Indexes published by Standard & Poor's/Global Real Analytics, LLC ("SPCREX™ Indices") for ... (1) Composite Index; Property Type Indexes on (2) Retail; (3) Office; (4) Apartments; and (5) Warehouse properties; Regional Indexes in (6) Desert Mountain West; (7) Mid-Atlantic South; (8) Northeast; (9) Midwest; and (10) Pacific West	Exercised into associated futures contract
Strike Prices	NA	1 point intervals above and below market price

CREX™ Index

Derivative Contract - Example

Contract Terms and Conditions

Based on a value of \$250 (contract multiplier) times the value of the underlying commercial real estate index.

If the SPCREX™ Office index equals 150.00 index points, the futures contract is nominally valued at \$37,500.

$$\begin{aligned}\text{Contract Value} &= \text{Contract Multiplier} \times \text{Index Value} \\ &= \$250 \times 150.00 \\ &= \$37,500\end{aligned}$$

Note: The minimum allowable price fluctuation (or “tick size”) is 0.20 index points. This translates in a minimum fluctuation of \$50 (= contract multiplier of \$250 x 0.20 index points).

CREX™ Index

Derivative Contract - Example

Contract Terms and Conditions - *Continued*

Long or short position, traders are required to post initial performance bonds (or “margin” in slang terms) with their futures broker (“Futures Commission Merchant” or “FCM”).

Positions are “marked-to-market” (“MTM”) daily and in cash.

There are no paper profits or losses in futures markets.

Initial performance bond requirements are subject to change, sometimes on short notice.

CREX™ Index

Derivative Contract - Example

Contract Terms and Conditions - *Continued*

Cash settlement based on published value of underlying SPCREX™ index on final settlement date.

Contracts held until futures contract expiration are marked-to-market, like any other trading day, at published value of underlying index.

Profits and losses apportioned to longs and shorts accordingly, and position stricken from books.

CREX™ Index

Derivative Contract - Example

Contract Terms and Conditions - *Continued*

Final Settlement Value based on originally published index value or the “headline number.”

Cash settlement preferred over physical delivery since it is impracticable to consider delivery of actual commercial real estate.

SPCREX™ Indices

