Financial Data on WRDS
CRSP, COMPUSTAT, and Research Analytics

Florida Gulf Coast University, Feb 11th 2020
Jun Wu, Ph.D.
Agenda

1. What is WRDS?
2. Accessing the Data
3. Sources of Financial Data
4. The Big Two: COMPUSTAT and CRSP
5. Advanced Access Features
6. WRDS Tools and Support
Overview of WRDS
What is WRDS?

- WRDS is the Platform that Finance/Accounting Academics use for Research
  - 100/100 Top Business Schools Worldwide
  - 400+/500 Top Business Schools Worldwide
  - 30+ Government and Corporate Clients

Today’s Talk will be relevant for
- How to get financial data from WRDS
  - Company financial statement (COMPUSTAT)
  - Stock related data (CRSP)
  - Research Analytics developed by WRDS

Takeaway For the Audience
- What is WRDS
- How to get access to the Data
- What other data sources are available
Evolution of WRDS

• Data Aggregator (1993 - present)
  • Access to Cloud Servers with Research Data and Macros
  • Economy of Scale in Data distribution
    • Over 500 clients and 50,000+ users from 33 countries
  • Full-time Technical support
    • Online help, email support, and 24/7 network monitoring

• Research Platform (2001– present)
  • Knowledge Base: Data Overviews, Research Applications, and SAS macros
  • Full-time Research support
    • Research Team: 8 Ph.D.s in Economics and Finance
    • Research Analytics (since 2013)
WRDS Contribution to Research

• Data Platform (computing/research data outsourcing)
  • Single source for leading business research databases
  • Maintain integrity of Data

• Standardizing Research
  • Variable Documentation, List of Manuals
  • Research Overviews, Applications (SAS code and macros)

• Linkage across different data sources
  • e.g. accounting data with stock market data
WRDS Data Vendors

- S&P Capital IQ
- Thomson Reuters
- Bureau Van Dijk
- CRSP
- NYSE
- FactSet
Recognition – Promotion of your work

- Press, peer recognition and visibility needed in today’s academic landscape

- **WRDS-SSRN Collaboration**
  - WRDS Research Paper Series
  - WRDS-SSRN Innovation Award™
    - Honoring Emerging Business Schools
    - Awarded to the Dean of the research institution

- **WRDS in the Media**
  - Press and social media campaigns highlight the institution and authors

- **Wharton-WRDS Best Paper Award™**
  - *I.e.: Tax Evasion Across Industries: Soft Credit Evidence from Greece* Researchers earned the attention of Greek policymakers and received extensive media coverage. The Greek government has examined the results and is already making policy changes based on this research.
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Accessing Methods on WRDS
Multiple Access Options

- **Web Queries:**
  For Downloading

- **Unix Patching:**
  Large Data Crunch

- **PC SAS/CONNECT:**
  For SAS language users
SAS Studio

https://wrds-cloud.wharton.upenn.edu/SASStudio/
Python (Jupiter Lab), R Studio
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Financial Data on WRDS
Sources of Financial Data

• Fundamentals/Filings
  • Yearly/Quarterly Snapshots of a Firm (Unit: Firm)

• Assets/Trading
  • Daily/Monthly Trading Price/Volume of a Security (Equity, Bond, Derivatives) (Unit: Issue)

• Industry Specific
  • (Ex) Bank specific database (Unit: Firm/Industry)

• Events/Transactions
  • M&A, Security Issuance (IPO, SEO), News Datasets (Unit: Firm)

• Institutional Investors (Hedge Funds and Mutual Funds)
  • Characteristics, Ownership, Return of Funds (Mutual/Hedge) (Unit: Fund)

• Firm Behavior/Individuals
  • Corporate Governance, Social Responsibility (Unit: Firm)
  • Analysts, Human Networks (Unit: Individual)
Florida Gulf Coast University Subscriptions

- Fundamentals/Filings
  - Yearly/Quarterly Snapshots of a Firm (COMPUSTAT- NA)
  - Yearly/Quarterly Snapshots of An International Company (COMPUSTAT- Global)
  - Audit Analytics
- Asset Prices and Returns
  - Daily/Monthly Trading Price/Volume of a Security (CRSP)
  - Crsp-COMPUSTAT Merged (CCM)
  - CRSP Mutual Funds
- Behavior/ IO
  - BoardEx, Execucomp, I/B/E/S
- WRDS Research Analytics (Value-added Research Tools)
Viewing Your Subscribed Dataset
Searching Dataset and Variable
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COMPUSTAT and CRSP
Accounting and Financial Data in COMPUSTAT

• COMPUSTAT North-America: **U.S. and Canadian** fundamental and market information on 35,000+ active and **inactive** public companies, from 1950-present

• **Fundamental data** available on an annual and quarterly frequencies with thousands of Income Statement, Balance Sheet, Statement of Cash Flows, and supplemental & industry-specific data items

• **Market data** available on a monthly and daily frequencies with Prices, Dividends, Returns, Trading Volume, Shares Outstanding and Short-Interest Information (Very Similar to CRSP in many dimensions)

Both Fundamental Data and Market Data are now in the same data feed and are **updated daily**
## COMPUSTAT Coverage

<table>
<thead>
<tr>
<th></th>
<th>COMPUSTAT North-America</th>
<th>COMPUSTAT Global</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Region</strong></td>
<td>U.S. and Canada</td>
<td>Others</td>
</tr>
<tr>
<td><strong>Coverage</strong></td>
<td>35,000+ active and inactive public companies</td>
<td>39,900+ active and inactive public companies</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>annual and quarterly</td>
<td>annual and quarterly</td>
</tr>
<tr>
<td><strong>Fundamental Date Range</strong></td>
<td>Annual 1950 - present</td>
<td>1987 - present</td>
</tr>
<tr>
<td></td>
<td>Quarterly 1962 - present</td>
<td>1987 - present</td>
</tr>
<tr>
<td><strong>Security Date Range</strong></td>
<td>Monthly 1962 - present</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Daily 1983 - present</td>
<td>1985 - present</td>
</tr>
</tbody>
</table>
COMPUSTAT Example

- Get Current Assets, Assets for Microsoft, Dell, and IBM between Jan 2015 and Jan 2016
COMPUSTAT Examples

- Finding Financial Statement Variables for IBM
- Finding Financial Statement Variables for unknown ID
- Finding ~ for more than one company with known IDs
- Add web query output filters
- Choose the output format you need
WRDS Support for COMPUSTAT

- Compustat online manual

- WRDS Documents

- Sample Programs (extracts, point-in-time, etc)
  Research → Sample Programs → Compustat

- Research Applications (book-to-market, P/E Ratio)
  Research → Applications
Stock Market Data in CRSP

• Center for Research in Security Prices (CRSP) is a research center at the Booth School of Business of the University of Chicago

• Comprehensive collection of daily and monthly security records for the NYSE/AMEX/NASDAQ/ARCA/BATS trading activities

• Daily and Monthly data for roughly 28K + securities of Domestic companies and ADRs traded on major exchanges from 1925–present

• Complete historical information :
  • Accurate records of special distributions and stock splits in return calculation
  • Keep delisting companies (pre-M&A or bankruptcies), and delisting returns
CRSP Example

- Get monthly prices, return and volume information for Microsoft and Ford from 1925 to 2008

CRSP Monthly Stock

Click here to preview this dataset! (Beta)

**Step 1:** Choose your date range.
Date range: 1925-12 to 2008-12

**Step 2:** Apply your company codes.
- Ticker
- PERMNO
- PERMCO
- CUSIP
- NCUSIP

Select an option for entering company codes
- msft 1

Please enter Company codes separated by a space.
Example: IBM MSFT AAPL [Code Lookup]

Upload a plain text file (.txt), having one code per line.
CRSP Examples

• Stock returns

• Stock headers

• Dividends/share repurchases

• Distribution

• Adjustment factors

https://wrds-web.wharton.upenn.edu/wrds/ds/crsp/stock_a/dist.cfm?navId=129
WRDS Support for CRSP

- Overview of CRSP/Compustat Merged Database in WRDS
  
  ![Support → Data → Manuals And Overviews → CRSP → CRSP/Compustat Merged (CCM) Overview](source)

- Sample Programs
  
  - Data Extracts, CCM and merging by CUSIP
  - Calculate CAPM beta and excess returns
  
  ![Research → Sample Programs → CRSP Sample Programs](source)

Research Applications

- Compound returns, Momentum and Governance Portfolios
- Fama-French factors and B/M portfolios, Beta Estimation

![Research → Applications](source)
How to Link CRSP and COMPUSTAT

- **CRSP**: the data source for US security (equity) trading records
  - since 1925, and 28,673 Securities (until 2010)
- **COMPUSTAT**: the data source of accounting items for US public firms
  - since 1950 and 29,701 Companies (until 2010)
- Major Difficulties to link CRSP and COMPUSTAT
  - Different Frequencies:
    - COMPUSTAT – Accounting items are on Annual or Quarter base
    - CRSP – Security trading data is Monthly or Daily
  - Different Universe of Companies
    - CRSP: Equities listed in NYSE, AMEX, NASDAQ, ARCA, and BATS
    - COMPUSTAT: 10K and 10Q Filers to the SEC
- Solution: Use the CCM(CRSP-COMPUSTAT Merged) Dataset
Primary Identifiers

- The Primary Identifiers are different
  - **COMPUSTAT**: GVKEY at firm level
  - **CRSP**: PERMNO (PERMCO) at security (firm) level

- **PERMNO** is a unique five-digit permanent identifier assigned by CRSP to each security: *Permanent*, and *Unique (Not Recyclable)*.

- **GVKEY** is a unique six-digit identifier and primary key for each company and assigned by COMPUSTAT: *Permanent*, and *Unique (Not Recyclable)*.
Common Secondary Identifiers

- **Stock Tickers**: Exchange Specific, with Suffixes, *NOT* Permanent, and Recyclable

- **CUSIP** also is *NOT* Permanent but Unique and *NOT* Exchange Specific.
  - 8- or 9-digit CUSIP is assigned for issues (e.g. equities and bonds).
  - 6-digit CUSIP is assigned for issuers (e.g. firms)

- **CIK**: US filing number at the SEC, and Changeable

- **Company Names** are often abbreviated/manipulated by data vendors
  - Very difficult to have a reliable merging code by using company names
Identifiers Example

<table>
<thead>
<tr>
<th>CRSP PERMANENT NUMBER</th>
<th>CRSP PERMANENT COMPANY NUMBER</th>
<th>START DATE OF EFFECTIVE</th>
<th>END DATE OF EFFECTIVE</th>
<th>CUSIP IDENTIFIER - HISTORICAL</th>
<th>EXCHANGE</th>
<th>TICKER SYMBOL - HISTORICAL</th>
<th>COMPANY NAME - HISTORICAL</th>
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</tbody>
</table>

1 PERMNO per stock
1 PERMCO per company
10 Different CUSIPs
5 Different Tickers
8 Different Names
CRSP-COMPUSTAT-Merged (CCM)

- CCM already merge CRSP and COMPUSTAT variables merged together
  
  [Access here](#)

- Note: we suggest select “LC”, “LU” as default links
  
  - For link type definitions, please visit CRSP manual [here](#), page 5


Advanced Data Access on WRDS
Advanced Features – Access Data Remotely on WRDS Server

• **What if a web query does not do all that you need it to do?**
  - Web queries usually cannot handle the requests with > 2 conditions
  
  Example: Find all companies in 1997 with sales greater than 1 billion, total assets greater than 5 billions, and with more than 30 years of publicly reported financial statements.

• **Two more ways to access finance data at WRDS**

<table>
<thead>
<tr>
<th>Method</th>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIX</td>
<td>Fast remote data access</td>
<td>Batch Running</td>
</tr>
<tr>
<td>PC-SAS/Connect</td>
<td>Interactive Programming</td>
<td>Slow remote data access, SAS Needs to be installed</td>
</tr>
</tbody>
</table>

Each method can perform a basic data extract and serve as the first step in a statistical analysis. The data can be analyzed remotely or imported into a local SAS system or even a second program to complete the analysis.

Customize your software (R, Python, SAS, etc) and connect to WRDS cloud server
PC-SAS / Connect – Concept

- SAS software installed on your Windows PC
  - Some local SAS dataset in your PC
  - Remote access WRDS data by connecting to WRDS server
    - Use WRDS powerful Unix server processing resources
    - Access Unix permanent (10GB) & temp (4.5TB) disk spaces

- Steps:
  1. Connect to WRDS server
     ```
     %let wrds = wrds-cloud.wharton.upenn.edu 4016;
     options comamid = TCP remote = WRDS;
     signon username = _prompt_;
     ```
  2. Remote Submit
     ```
     rsubmit;
     {Program}
     endrsubmit;
     ```

Support → Getting Started -> Accessing WRDS -> PC-SAS Connect
Example: Find all companies in 1997 with sales $\geq 1\text{ billion}$, total assets $\geq 5\text{ billions}$, and with $\geq 30\text{ years}$ of publicly reported financial statements.

```sas
/* PC-SAS/Connect Communication Block */ %let wrds = wrds-cloud.wharton.upenn.edu 4016; options comamid=TCP remote=WRDS; signon username=_prompt_; /* Submit SAS code to WRDS Unix Server */ rsubmit ;

/* SAS CODE submitted to WRDS Sever */ proc sql;
  create table demo (where= (fyear=1997 and sale$\geq 1000$ and at$\geq 5000$ and firm_age$\geq 30$) as
  select fyear, conm, tic, gvkey, sale, at, (fyear - min(fyear)) as Firm_Age
  from comp.funda where not missing(at) and consol="C" and indfmt="INDL" and datafmt="STD" and popsrc="D"
group by gvkey;
quit;

/* Remote SAS CODE submission Ends */ endrsubmit;
/* Sign off from PC-SAS/Connect */ Signoff;
```
How to Access SAS Data in UNIX

1. Install SFTP Client software in your PC (freeware such as WIN SCP)

2. Set SFTP Client to be connected to the server: wrds.wharton.upenn.edu with your wrds (wharton) username and password

3. Retrieve and Upload files in SAS and other formats among your local machine and remote UNIX server.

Support → Getting Started -> Accessing WRDS - > SSH & UNIX
How to run SAS in UNIX

1. Install SSH Secure Shell (free) software in your PC
2. Set SSH to be connected to the server: wrds.wharton.upenn.edu with your wrds (wharton) username and password
3. Create, Edit and Run your SAS program using Unix commands.
Step-by-step Remote Access Setup
For Programming (SAS) Beginners

- WRDS support page has a lot of documentation and material for SAS and Unix
- There are a lot of useful SAS Books. Among them:
WRDS Support
Research and Technical Support

• Online Help
  • Database Manuals plus additional support documentation
    Data Overviews
    Research Applications
    Sample Programs
    Variable Search
    Company Search
  • WRDS Knowledge Base: FAQ archive of answers to common user questions

• Email support at wrds-support@wharton.upenn.edu (Monday-Friday, 9a-5p EST)
  Researchers and Technical Experts ready to assist with:
  • Data extraction, merging, and management.
  • Programming and technical problems
Research and Technical Support

• Event Studies
• Intraday Indicators Database
• Financial Ratios
• Bond Returns
• Option Suite
• SEC Analytic Suite
• Beta Suite

(Not covered in this presentation: Linking suite, Efficient Frontier, Country Total return series, SAS Visual Analytics…)
Analytics Benefits

- **Lower** the tech bar for research
- Avoid big data manipulation and potential errors
- Ready-to-use control variables (and research tools)
- Documented **manuals and code**
- Questions? Fully supported by WRDS
- **Free** on WRDS (as long as you have data subscription)
Where are the Research Analytics in WRDS

- 2IQ
- American Hospital Association
- AuditAnalytics
- Bank Regulatory
- Beta Suite by WRDS
- Blockholders
- BoardEx
- Bureau van Dijk
- Calcbench
- CBOE Indexes
- CENTRIS
- Clarivate Analytics
- Compustat - Capital IQ
- ComScore
- Contributed Data
- Fama French & Liquidity Factors
- Federal Reserve Bank
- Financial Ratios Suite by WRDS
- FTSE/Russell
- GovPX
- GSIOline
- Hedge Fund Research (HFR)
- IBES
- IHS Global Insight
- IMS – SK&A
- Infogroup
- Institutional Shareholder Services (ISS)
- Intraday Indicators by WRDS
- Option Metrics
- Option Suite by WRDS
- OTC Markets
- PACAP
- Penn World Tables
- Peters and Taylor Total Q
- PHLX
- ProPublica
- Public
- RavenPack News Analytics
- RentBureau
- RepRisk
- Research Quotient
- SAS Visual Analytics
- SEC Order Execution

New Data Coming Soon

Toyo Keizai Access the most comprehensive earnings information for all listed companies in Japan. Scheduled for release in April 2018.


Have you conducted research using WRDS? Let us know so we can...

Let View all data available on WRDS
WRDS Research Analytics

[Event Study by WRDS logo]
Event Study Highlights

**Create** instant visualization of the effect of events. **Extract** detailed, in-depth data for analysis. **Retrieve** the behind-the-scenes set of codes. **Access** in-depth documentation on methodologies.

The event studies are widely used by empirical researchers in finance, economics, accounting, law, and other business disciplines to analyze the market reaction to firm specific and market-wide events using either returns or volume around the time when event occurred.

Some examples include: earnings announcements, M&As, new capital issues, and announcements of macroeconomic variables (unemployment or trade deficit), measure impact on the value of a firm resulting from a change in the regulatory environment, or to assess the damages.

Contact Us:
wrds@wharton.upenn.edu

For more details, please see the research application "Run an Event Study", or the research macro "EVTSTUDY".

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**Event Study by WRDS**

- **U.S. Daily Event Study**: Upload your own events
- **International Event Study (Compustat Global)**: Upload your own events
- **International Event Study (Global Insight)**: Events from Capital IQ
- **Intraday Second-by-Second Event Study**: Events from Capital IQ
- **Long Run Event Study**: Upload your own events
- **Long Run Event Study**: Events from Capital IQ
How to run an Event Study in WRDS?

1. Choose your date range:
   - Start: 01-01-81
   - End: 2012-12-31

2. Please select type of event:
   - Corporate Guidance - Lowered
   - Corporate Guidance - New/Announced
   - Corporate Guidance - Raised
   - Corporate Guidance - Unusual Events
   - Debt Defaults
   - Debt Financing Related
   - Delayed Earnings Announcements
   - Initial Public Offerings
   - Initial Public Offerings - Initiator
   - Market Adjusted Models
   - Market Capitalization
   - Market Indices
   - Other Market Related
   - Rights Announcements
   - Stock Dividends
   - Stock Splits
   - Takeovers
   - Underwriting
   - Unusual Events

3. Risk model:
   - Market Adjusted Model
Intraday Stock-Splits Announcements

(01JAN2002 09:30:00 - 30JUN2016 16:00:00). #Events=166
Event Study Code

Event Study Code is also available in WRDS…

SAS Code Link

<table>
<thead>
<tr>
<th>Features</th>
<th>Frequency</th>
<th>Daily</th>
<th>Intraday</th>
<th>Long-run</th>
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</thead>
<tbody>
<tr>
<td>Upload your own event file</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Output data for additional analysis</td>
<td>✔️</td>
<td>✔️</td>
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<td></td>
</tr>
<tr>
<td>US returns</td>
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<tr>
<td>International returns</td>
<td>✔️</td>
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<td></td>
</tr>
<tr>
<td>Events from Capital IQ (Key Dev)</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Events from Ravenpack</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Financial Ratios

- **Financial Ratio Suites:**
  - 70+ financial ratios for both firms and industry level in US
  - CRSP/COMPUSTAT/IBES from 1970
  - Output at monthly frequency!
- Most widely used academic literature
- Empirical researchers in Corp Finance and Asset Pricing
Financial Ratios Industry Level

• Calculates Industry/Sector average ratios:
  • Fama & French 10, 12, 17, 30, 48, 49 industries
  • GICS 10 sectors
  • Direct and easy solutions to industry level controls
  • Work with firm level ratio variables seamlessly to adjust industry effect
Financial Ratios Industry Level

GICS Sectors - Selected S&P 500 Securities

GICS 10 Industry Averages (Median):
- Energy
- Materials
- Industrials
- Consumer Discretionary
- Consumer Staples
- Health Care
- Financials
- Information Technology
- Telecommunication
- Utilities

Select Securities

GICS 10
Fama-French 10

Ratios:
- Dividend Payout Ratio
- Enterprise Value Multiple
- Price/Cash Flow
- P/E (Diluted, Excl. EI)
- P/E (Diluted, Incl. EI)
- Price/Operating Earnings (Basic, E)
- Price/Operating Earnings (Diluted)
- Forward P/E to 1-year Growth (PEG)
- Forward P/E to Long term Growth
- Trailing P/E to Growth (PEG) ratio
- Price/Sales
- Price/Book

Profitability:
- After-tax Return on Average Common Equity
- After-tax Return on Total Stockholder's Equity
- After-tax Return on Invested Capital
- Effective Tax Rate
- Gross Profit Margin
- Net Profit Margin

Net Profit Margin

Gross Profit/Total Assets

GICS Sectors:
- Energy
- Materials
- Industrials
- Consumer Discretionary
- Consumer Staples
- Health Care
- Financials
- Information Technology
- Telecommunication
- Utilities
Financial Ratios - Detail

Classify the ratios into the following 7 themes:

1. **Capitalization**: e.g.: Capitalization Ratio, Total Debt-to-Invested Capital Ratio;
2. **Efficiency**: e.g.: Asset Turnover, Inventory Turnover;
3. **Financial Soundness/Solvency**: e.g.: Total Debt to Equity Ratio, Interest Coverage Ratio;
4. **Liquidity**: e.g.: Current Ratio, Quick Ratio;
5. **Profitability**: e.g.: ROA, Gross Profit Margin;
6. **Valuation**: e.g.: P/E ratio, Shiller’s CAPE ratio;
7. **Others**: e.g.: R&D-to-Sales, Labor Expenses-to-Sales.
# Financial Ratios Firm Level

<table>
<thead>
<tr>
<th>CRSP PERMNO</th>
<th>Public Date</th>
<th>Fiscal year end</th>
<th>Fiscal quarter end</th>
<th>Book/Market</th>
<th>Dividend Yield</th>
<th>Return on Assets</th>
<th>Return on Equity</th>
<th>Short-Term Debt/Total Debt</th>
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<td>0.865</td>
<td>1.35%</td>
<td>0.090</td>
<td>0.045</td>
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<tr>
<td>81912</td>
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<td>20090331</td>
<td>20090930</td>
<td>1.486</td>
<td>5.86%</td>
<td>0.086</td>
<td>0.050</td>
<td>0.152</td>
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<tr>
<td>27991</td>
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<td>78049</td>
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<td>2.265</td>
<td>2.22%</td>
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<td>20090930</td>
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<td>10779</td>
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<td>0.033</td>
<td>-0.013</td>
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<td>-0.245</td>
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<td>20090930</td>
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<td>20090131</td>
<td>20091031</td>
<td>0.363</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Open Source Code

WRDS Industry Financial Ratio

August 2016

WRDS Research Team

Overview

WRDS Industry Financial Ratio (WIFR hereafter) is a collection of most common financial ratios by academic researchers. There are in total over 70 financial ratios falling into the following seven categories: Capitalization, Efficiency, Financial Soundness, Profitability, Valuation, and Others. Ratios for each individual company as well as aggregated level are included in the output.

Parameter Specification

Universe Selection:

Users can choose between the universe of CRSP Common Stock and S&P S&P 500, and many of the ratios studied here are void of economic meanings among the firms but have excluded these firms from our universe.

Industry Classification:

Two systems of industry classification are accepted in the WIFR: GICS (Globally Integrated Classification System) and Fama-French Industry Classification. More specifically, the GICS classifies industries into distinct economic sectors: Energy, Materials, Industrials, Consumer Discretionary, Staples, Health Care, Financials, Information Technology, Telecom and Utilities. This carries more than one unique industry classification system, we allow user to select number of industries.

```r
/* Set Universal Input Variables */
%let uni_begdt = 01JAN2000;
%let uni_enddt = 31DEC2015;
%let uni_sp500 = 1;

%MACRO FINRATIO (begdate=, enddate=, sp500=, ratios_out=);
/*Impose filters to obtain unique gvkey-datatype records*/
%let compcond=indfmt='INDL' and datafmt='STD' and popsrc='D' and consol='C';
%if &sp500=1 then %let sp500_where=and sp500=1; %else %let sp500_where=and sp500=1;
/*List of Ratios to be calculated*/
%let vars=pe_op_basic pe_op_dil pe_exi pe_inc pcfc evm bm capex dpr npm opmbd opnmd gpm ppm roa roce aftret_eq aftret_inv prenet_earn;
%let equity_invcap debt_invcap totdebt_invcap int_debt_int_totdebt cash_lt invt_act ext_act debt_at short_debt curr_debt_lt debt_invcap debt_ewtda ccf_lct lt_pent dlt_be debt_assets debt_capital de_ratio into currently quick_ratio curr_ratio inv_turn at_turn_retl_turn pay_turn sales_invcap sal eq eq_nuc rd_sale accrual gprof cash_conversion efectax into;
%let alllars=8var s divyield pbt bnm peg_trailing peg_1yforward peg_2yforward;
/*CompuStat variables to extract*/
%let evars=
SEQ cgq TDXICT TDXB ITCPEG PSTKR PSTKL PSTK prcc_f cash epsf ex epsf openpex openp openx ebit ebit1 np net sale ldjv dvc ddp olad dp oladp gp revt cogs pi ibc dpc at ni ibc1 acpdt mib eq xoga xldo xint mli pent act lct dlt dlc the invt lrt xopr oanct txp txt ap xrd xad xln capx;
/*Define which accounting variables are Year-To-Date, usually from income/cash flow statements*/
%let vars=ytd=sale dp capp cogs xido xint xopr ni pi olad dp olad p openp openx epsf epsf ibad1 ibcon ia mic mib dpc xrd txt sp
proc sql noprint;
select distinct lowcase(name) into :qvars separated by ,
from dictionary.columns
where lname='COMP' and mmname='DATA'
and find(lowcase("&alvars."),sub(lowcase(name),1,length(name)-1))>0;
quilt;
/*Extracting data for Ratios Based on Annual Data and Quarterly Data*/
data_compile;
set comp.Funda (keep=gvkey datatype fyyear fyear datafmt indfmt consol popsrc prcc_f &alvars.);
where &compcond; if at (<0 then at_=.)
```
WRDS Bond Returns
Why Bond Returns?

- No database offering bond return

Why is it cumbersome?
- Source data (TRACE) requires a lot of cleaning
- Need to link with Mergent FISD
- Calculation of accrued interest is not straightforward
Bond Return Database - Input

• TRACE Enhanced and Standard (Transaction Records):
  • Requires a ton of cleaning -
    • Cancellation, Correction, Reversal
    • Double Counting due to agency transaction
    • Missing price/volume/dates range

• Mergent FISD (Bond Characteristics):
  • Bond Type
  • Issue and Maturity Date
  • Coupon rate and frequency
  • Bond rating
  • Default Info
Output 1: Monthly Bond Return Data

Monthly Bond Return Data (CRSP.MSF style for bond)

Time span: 2002/07 – Now

Universe: US Corporate Bond (TRACE ∩ FISD)

<table>
<thead>
<tr>
<th>Bond IDs</th>
<th>Offering Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE</td>
<td>Offering Date</td>
</tr>
<tr>
<td>ISSUE_ID</td>
<td>Offering Amount</td>
</tr>
<tr>
<td>CUSIP</td>
<td>Offering Price</td>
</tr>
<tr>
<td>TRACE Bond Symbol</td>
<td>Principal Amount</td>
</tr>
<tr>
<td>ISIN</td>
<td>Maturity</td>
</tr>
<tr>
<td>Company Symbol</td>
<td>Coupon</td>
</tr>
<tr>
<td>Bond Types</td>
<td>Day Count Basis</td>
</tr>
<tr>
<td>Security Level</td>
<td>First Interest Date</td>
</tr>
<tr>
<td>Convertible</td>
<td>Last Interest Date</td>
</tr>
<tr>
<td></td>
<td>No Coupons Per Year</td>
</tr>
<tr>
<td>31-Dec-14</td>
<td>20131203</td>
</tr>
<tr>
<td>604189</td>
<td>500000</td>
</tr>
<tr>
<td>594918AX2</td>
<td>99.654</td>
</tr>
<tr>
<td>MSFT4077804</td>
<td>1000</td>
</tr>
<tr>
<td>US594918AX20</td>
<td>20431215</td>
</tr>
<tr>
<td>MSFT</td>
<td>4.875</td>
</tr>
<tr>
<td>CDEB</td>
<td>30/360</td>
</tr>
<tr>
<td>SEN</td>
<td>20140615</td>
</tr>
<tr>
<td>0</td>
<td>20430615</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Credit Ratings
Rating S&P: AAA
Rating Moody's: AAA
Rating Fitch: AA+
RATING_CLASS: 0.1G

Pricing Info
Execution Date: 30-Dec-14
Total Par-Value Volume: $95,773,000
Total Dollar Volume: $109,908,606
Avg Bid/Ask Spread: 0.40%
Yield: 3.85%
Price-End of Month: 117.8
Return-End of Month: 2.53%
Bond Return Database

- Report various bond monthly returns (due to illiquidity in bond trading)
  - **LDM** – Last day DSI trading month (e.g. 8/31), missing if didn’t trade on that day
  - **L5M** – Last price but has to be within 5 days of DSI indicated end of month (e.g. 8/31, 8/30, …, 8/25)
  - **EOM** – Last price at which the bond was traded (e.g. 8/31, 8/28, 8/4)
Output 2: Clean TRACE Data

Output 2: *Code to clean* TRACE Enhanced and TRACE Standard

- Handled trade cancellation/correction/reversal, double reporting

```plaintext
/* *****************************/
/* This code cleans the various data issues in Trace Enhanced File */
/* Logic of the cleaning procedure largely follows the discussion of Dick-Nielsen (2009) */
/* Cleaning procedure takes care of Cancellation, Correction, Reversal and Double Counting */
/* Code is also designed to handle both pre and post 2012/02/06 change in the Trace System */
/* Author: Qingyi (Freda) Song Drechsler */
/* Date: Written and Tested in October 2017 */
/* *****************************/
libname fisd '/wrds/mergent/sasdata/fisd' '/wrds/mergent/sasdata/naic';
libname trace '/wrds/trace/sasdata/standard';
libname tracee '/wrds/trace/sasdata/enhanced';
libname mylib '';

/* *****************************/
/* Step 0: Understanding Data Fields */
/* *****************************/
/* */
proc sql;
create table __trc_st_pre as select distinct trc_st, count(*) as nobs
from tracee.trace_enhanced (where=(trd_rpt_dtc<'05FEB2012'd)) group by trc_st; quit;
```
**Output 3: Bond to CRSP Linking Table**

- Bond ID (CUSIP) \(\iff\) Equity ID (PERMNO) \(\iff\) Date Range
- Traces bonds through M&A, Ticker Change, etc.

<table>
<thead>
<tr>
<th>cusip</th>
<th>company_symbol</th>
<th>startdt</th>
<th>enddt</th>
<th>permno</th>
<th>permco</th>
<th>namedt</th>
<th>nameendt</th>
<th>link_startdt</th>
<th>link_enddt</th>
</tr>
</thead>
<tbody>
<tr>
<td>023551AM6</td>
<td>AHC</td>
<td>20020701</td>
<td>20091014</td>
<td>28484</td>
<td>20064</td>
<td>20020102</td>
<td>20060508</td>
<td>20020701</td>
<td>20060508</td>
</tr>
<tr>
<td>023551AM6</td>
<td>HES</td>
<td>20091022</td>
<td>20141228</td>
<td>28484</td>
<td>20064</td>
<td>20060509</td>
<td>20160831</td>
<td>20091022</td>
<td>20141229</td>
</tr>
</tbody>
</table>
Why $\beta$?

- (Almost) every empirical paper touches $\beta$
- Rolling $\beta$
  - Traditionally, used SAS macros …… with Loops
  - Takes too long, especially daily
    - 22 years ~ 5500 trading days
    - 5500 temp datasets, 5500 regression -> Hours!!
- Solution
  - WRDS Analytics: Beta Suite -> Minutes
  - Why is this faster?
    - We do the Matrix Calculation using Proc Expand
    - Looping Proc Reg VS Proc Expand Once
WRDS Analytics – Beta Suite

• Input
  • CRSP Universe/Custom List
  • Date Range
  • Risk Model Selection
    • Scholes-Williams (Only Daily)
    • Market Model
    • FF 3 Factor Model/FF 4 Factor Model
  • Frequency:
    • Daily/Weekly/Monthly
  • Estimation Window / Minimum Window
    • Ex) Daily: 252/126 days; Monthly: 36/12 months

• Output
  • $\alpha$, $\beta$s
  • Excess Return
  • $R^2$
  • IVol
  • Tvol
  • NumObs
WRDS Intraday Indicators
TAQ

• TAQ is an Intraday Transactions data (Trade And Quote) for all securities listed on the NYSE/AMEX/NASDAQ
  • Calculate stock-millisecond (high-frequency) price/flow/liquidity
  • Most important data for empirical Market Microstructure studies
  • Other fields (empirical asset pricing/market efficiency): liquidity as right-hand-side variable, intraday event before and after tests

TAQ Data Challenges

1. Too many Files
   • CRSP DSF contains all historical daily prices (1926~2016) in a single file
   • TAQ files are stored in 5538 daily files. (1993~2014)

2. File sizes are huge (~200TB)
   • A single day’s worth of TAQ (Quote: ~100 GB; Trade: ~10 GB)
   • CRSP: ~14GB for all historical prices

3. Processing Takes Long Time
The **WRDS Intraday Indicator Dataset (IID)** is a TAQ-derived product that helps to lower the computation barrier of NYSE TAQ data for financial research

- **Availability:** Daily summaries (2003-present Millisecond, 1993-2014 Second)
- **Offers** 159 variables covering liquidity, volatility, trade classification, informativeness, (after) market-hour summaries, special order summaries, and many others at stock-day level
- **Interim files for research:** Complete NBBO files, Consolidated trade files

**Market Average Effective Spread, 1993-2019**

- ~300 TB data
- 6 months of single-task computing → 3-4 minutes
WRDS SEC Suite
WRDS SEC Analytics Suite

• Filings & Index dataset filings:
  • All electronic filings from the SEC since 1994

• Search Engine:
  • Google-Like search over all 10-K, 10-Q, 8-K, etc

• Readability & Sentiment Dataset
  • Readability Indices (e.g. Fog, and Flesch)
  • Linguistic Sentiments (e.g. Loughran and McDonald)

And many more (to come)
## The SEC Index Data

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<tr>
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<th>Filing Date</th>
<th>Index Date</th>
<th>Type</th>
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<tbody>
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<td>1994-10-14</td>
<td>S-8</td>
<td>AAR CORP</td>
<td>edgar/dat...</td>
</tr>
</tbody>
</table>
Search Engine: SEC Filing Search

WRDS SEC Analytics Suite

Search through the contents of millions of SEC filings. Access Readability and Sentiment scores and Linking Tables.

For more about this dataset, see the Dataset List or Manuals and Overviews.

WRDS SEC Filings Index Data
WRDS SEC Filings Queries
WRDS SEC Linking Tables

SEC Filings Index
SEC Filings on WRDS
Readable and Sentiment
SEC Filings Search
List of Filings Exhibits
List of 8K Items

Historical Company Names
CIK-CUSIP Link Table
GVKEY-CIK Link Table
Questions?

Jun (Research Support): jun5@wharton.upenn.edu

Lindsay (Marketing Executive): lindsmi@wharton.upenn.edu
Thank You!
Appendix: List of Datasets by Topic

• Fundamentals/Filings
  • Yearly/Quarterly Snapshots of a Firm (Unit: Firm)

• Assets/Trading
  • Daily/Monthly Trading Price/Volume of a Security (Equity, Bond, Derivatives) (Unit: Issue)

• Industry Specific
  • (Ex) Bank specific database (Unit: Firm/Industry)

• Events/Transactions
  • M&A, Security Issuance (IPO, SEO), News Datasets (Unit: Firm)

• Institutional Investors (Hedge Funds and Mutual Funds)
  • Characteristics, Ownership, Return of Funds (Mutual/Hedge) (Unit: Fund)

• Firm Behavior/Individuals
  • Corporate Governance, Social Responsibility (Unit: Firm)
  • Analysts, Human Networks (Unit: Individual)
## Fundamentals/Filings - Fundamentals

<table>
<thead>
<tr>
<th>Fundamentals</th>
<th>Domestic</th>
<th>Global</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Compustat NA</td>
<td>Amadeus(BvD)</td>
</tr>
<tr>
<td></td>
<td>Facstset NA</td>
<td>Compustat Global</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CIQ - Capital Structure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thomson Worldscope</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Factset International</td>
</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Europe: Osiris(BvD)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>China: CSMAR</td>
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<tr>
<td></td>
<td></td>
<td>Asia Pacific: PACAP</td>
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</table>
## Fundamentals/Filings – Filings & Audit

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<tr>
<th>Fundamentals</th>
<th>Segments</th>
<th>Compustat Segments: Customer / Geographic / Business</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Facset Revere: Product/Geographic/Business</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thomson Worldscope Segments</td>
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</tbody>
</table>

<table>
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<th>Audit</th>
<th>AuditAnalytics</th>
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</thead>
<tbody>
<tr>
<td>Filings</td>
<td></td>
<td>WRDS SEC Analytics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Compustat Filings</td>
</tr>
<tr>
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<td></td>
<td>Calcbench</td>
</tr>
</tbody>
</table>
## Assets/Trading – Equity/Bonds

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<th>Equity</th>
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<th>CRSP</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Global Stock</td>
<td>Compustat Global</td>
</tr>
<tr>
<td></td>
<td>Regional Stock</td>
<td>CSMAR</td>
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<tr>
<td></td>
<td>OTC</td>
<td>OTC Markets</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bond</th>
<th>Bond Data</th>
<th>Issue Level Data: Mergent FISD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Transaction: TRACE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Insurance Company Transaction: Mergent FISD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSRB: Municipal</td>
<td></td>
</tr>
<tr>
<td>Treasury</td>
<td>CRSP Treasury</td>
<td>GovPX</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
## Assets/Trading – Other Assets

<table>
<thead>
<tr>
<th>Loans</th>
<th>Dealscan</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Derivatives</strong></td>
<td></td>
</tr>
<tr>
<td></td>
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