The Financial Mathematics and Computation Cluster (FMC) was established in 2009. FMC is funded by Science Foundation Ireland and Industry. Further details about FMC are in the appendix and http://www.fmc-cluster.org/

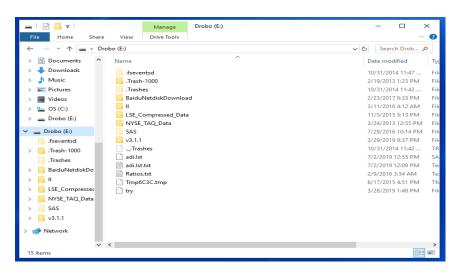


Note: Databases are located in standalone computers in the Financial Data room.

NYSE Trade and Quote (TAQ) Database

The TAQ database includes data on intraday transactions (trades and quotes) for all the securities listed on the New York Stock Exchange (NYSE), American Stock Exchange (AMEX), Nasdaq National Market System (NMS) and SmallCap issues. The transaction data that is reported outside of the Consolidated Tape hours of operation is not included in this database.

1. Select Drobo (E:) hard drive



Note: Please connect the hard drive to CPU, if not already connected.

2. Select NYSE_TAQ_Data

| TAQWIN32 | | | | – 🗆 × |
|---|------------------------------------|--------------------|--------------------|--------------|
| File Home Share | View | | | ~ 😨 |
| \leftarrow \rightarrow \checkmark \uparrow \square \rightarrow Drol | bo (E:) > NYSE_TAQ_Data > TAQWIN32 | | ٽ ~ | Search TAQ 🔎 |
| Documents | Name | Date modified | Туре | Size |
| 👆 Downloads | JOBS | 9/26/2014 5:43 PM | File folder | |
| 👌 Music | LISTS | 9/7/2010 3:42 PM | File folder | |
| Pictures | LOGS | 9/7/2010 3:42 PM | File folder | |
| Videos | OUTPUT | 2/24/2015 12:19 PM | File folder | |
| SS (C:) | SOUNDS | 9/7/2010 3:42 PM | File folder | |
| Drobo (E:) | TAQOUT | 2/22/2012 1:32 PM | File folder | |
| 51000 (21) | README.TXT | 9/7/2010 3:43 PM | Text Document | 96 KB |
| 👝 Drobo (E:) | TAQ3.exe | 9/7/2010 3:43 PM | Application | 3,210 KB |
| .fseventsd | TAQ3.INI | 7/2/2019 12:58 PM | Configuration sett | 2 KB |
| .Trash-1000 | | | | |
| .Trashes | | | | |
| BaiduNetdiskDo | | | | |
| | | | | |
| LSE Compressed | | | | |
| NYSE TAQ Data | | | | |
| SAS | | | | |
| v3.1.1 | | | | |
| V5.1.1 | | | | |
| Network | | | | |
| ~ | | | | |
| 9 items | | | | |

3. Select TAQWIN32 and then select TAQ3.exe

Extract the data that you need from the NYSE_TAQ_Data folder.

| NYSE TAQ3 | - 🗆 X |
|--|---|
| <u>F</u> ile <u>H</u> elp | |
| ∐ 100 100 100 100 100 100 100 100 100 10 | ● |
| Job List Program <u>S</u> ettings | |
| Source Folder: | Program Options: |
| E: [DROBO] | Load <u>M</u> aster File at Startup |
| E:\ NYSE_TAQ_Data | ✓ Jobs are <u>A</u> ctive by Default |
| 200901 | ✓ Enable Program Sounds ☐ Delete Temp Files at Exit |
| CO0902 | |
| □ 200903 □ 200904 ∨ | Delay Settings: |
| USERGUID1.1.9.pdf | Search Delay: |
| | 750 |
| | Hint Delay: |
| | 2500 |
| 1 | |
| | |
| 3.09.044 - 7/23/2008 Jobs: 1/1 | Ready. |

Note: Please unzip the data files before selecting the data for analysis.

4. You will then be directed to the job entry form where you can describe your analysis.

| NYSE TAQ3 - Job Entry Form - [Untitled J | ob] | | - | | × |
|---|---|--|--|--------------------------|---|
| <u>F</u> ile <u>H</u> elp | | | | | |
| Def Def New Job Save Job | Bun Job Close Job | | | | |
| Step <u>1</u> : Select Data Step <u>2</u> : Select Issu | ue Step <u>3</u> : Data Formats | Step <u>4</u> : Filter Data S | tep <u>5</u> : Output |] | |
| Job Description: test run Process Options: Retrieve Trades Retrieve Quotes Calculate Daily Statistics Include Header Information First Record Only Include Mast Information Include Div Information Include Corrections | Time Period: Image: Pick Ranges CD Contents Last Year Current Year Latest Month 1st Quarter 2nd Quarter 3rd Quarter 4th Quarter Latest Quarter C Latest Quarter C Latest Quarter C Latest Quarter | Date Range: Month Of: Start Date: 1/ 1/2011 v End Date: 6/30/2011 v | Time Period Full Day Selected Time Rang Start Time 11:40:23 End Time: 1:02:07 | d: I Time e: AM | |
| .09.044 - 7/23/200 Symbols: 0 Re | ady. | | | | |

5. You can then select the securities either by Ticker Symbol or CUSIP Number.

| Eile Help Default Job Default Job Eur Job Close Job Step 1: Select Data Step 2: Select Issue Step 3: Data Formats Step 4: Filter Data Step 5: Dt Input Type: Enter Symbol: | utput ন্থ্য Bac <u>k</u> | Next | 1 |
|--|--------------------------------|------|---|
| New Job Save Job Default Job Run Job Close Job Step 1: Select Data Step 2: Select Issue Step 3: Data Formats Step 4: Filter Data Step 5: Data Input Type: Enter Symbol: | | | 1 |
| Input Type: Enter Symbol: | | | 1 |
| Input Type: Enter Symbol: | | | 1 |
| ○ Ticker Symbols | | | 1 |
| C Cusip Numbers Symbols to Process: | | | |
| 4 <i>it</i> | | | |
| Input Source: C Selected Securites C Attached File C All Securites | | | |
| Linked Symbol List File: | 1 | | |
| e: \adi. Ist | 1 | | |
| | | | |
| | | | |
| 09.044 - 7/23/200 Symbols: 1 Ready. | | | |

6. In the next step you can choose the data format.

| NYSE TAQ3 - Job Entry Form - [Untitled Job] | - | | × |
|--|----------------------------------|-----|---|
| <u>File</u> <u>H</u> elp | | | |
| Image: black state Image: black state Image: black state New Job Save Job Default Job Run Job Close Job | | | |
| Step 1: Select Data Step 2: Select Issue Step 3: Data Formats Step 4: Filter Data Step 5: D Number Format: Time Format: Date Format: O YYMMDD Image: Ware Decimals Image: HH:MM:SS YYYMMDD O YYYMMDD Image: Ware Decimals Seconds MM/DD/YYYY MM/DD/YYYY Image: Ware Decimals Image: Ware Decimals Image: Ware Decimals Image: Ware Decimals Image: Ware Decimals Image: Ware Decimals Image: Ware Decimals Image: Ware Decimals Image: Ware Decimals Image: Ware Decimals Image: Ware Decimals | Dutput ह्या Bac <u>k</u> | Nex | |
| | | | |
| .09.044 - 7/23/200 Symbols: 1 Ready. | | | |

7. Now, choose the field that you want to include in the output files.

| File Help New Job Save Job Default Job Run Job Close Job Step 1: Select Data Step 2: Select Issue Step 3: Data Formats Step 4: Filter Data Step 5: Output Quote Fields: Trade Fields: Exchanges: Y A-AMEX Y B-BOSTON Pack Next Y BID Y DFR Y COND Y C-NATIONAL STOCK EXCHANGE Next Y OFR Y COND Y N-NYSE Y COND Y N-NYSE Y OFR SIZE Y GI27 Y G127 Y T-NASDAQ Y A-PHILADELPHIA Y OFR MID Y G127 Y G127 Y O-INSTINET Y W-CBOE Select All Select All Select None Select None | NYSE TAQ3 - Job Entry Form - [Untitled Job] | — | × |
|--|---|----------|---|
| New Job Save Job Default Job Bun Job Close Job Step 1: Select Data Step 2: Select Issue Step 3: Data Formats Step 4: Filter Data Step 5: Output Quote Fields: Trade Fields: Fachanges: Image: Constraint of the state of the s | <u>File</u> <u>H</u> elp | | |
| Quote Fields: Trade Fields: Exchanges: Image: Product State Imag | | | |
| V EX V EX V A-AMEX Back Back Back Back Next V TIME V TIME V PRICE V C-NATIONAL STOCK EXCHANGE Back Next V BID V PRICE V C-NATIONAL STOCK EXCHANGE V Mode Next Next V OFR V COND V M-CHICAGO V M-CHICAGO V M-CHICAGO V OFR SIZE V CORR V P-ARCHIPELAGO V T-NASDAQ V MODE T SEO V X-PHILADELPHIA O-INSTINET V MMID V G127 V M-CBOE V D-NASD(ADF) | Step <u>1</u> : Select Data Step <u>2</u> : Select Issue Step <u>3</u> : Data Formats Step <u>4</u> : Filter Data Step <u>5</u> : C |) Dutput | |
| Select All Select All Select None | Image: Construct of the second sec | | |
| | Select All Select All Select None | | |

8. Finally, you can create output files by entering the trade, quote and statistics file name.

| NYSE TAQ3 - Job Entry Form - [Untitled Job] | _ | | < |
|---|------------------------|-----------------|---|
| <u>File</u> <u>H</u> elp | | | |
| Image: block with the second secon | | | |
| | | | |
| Step <u>1</u> : Select Data Step <u>2</u> : Select Issue Step <u>3</u> : Data Formats Step <u>4</u> : Filter Data Step <u>4</u> : Step <u>4</u> | itep <u>5</u> : Output | | _ |
| Output File Type: Destination: Output Options: Image: Construction of the structure of the structu | ন্থ্য Bac <u>k</u> | e Bun | |
| Trades Output File Name: e:\nyse tag data\tagwin32\output\trade1.txt | | | |
| Quotes Output File Name: | 1 | | |
| e:\nyse_taq_data\taqwin32\output\quotes1.txt | 😫 👩 | | |
| Daily Statistics Output File Name: | | | |
| e:\nyse_taq_data\taqwin32\output\stats1.txt | 😫 🔓 | | |
| | | | |
| .09.044 - 7/23/200 Symbols: 1 Ready. | | | |



Industry

FMC² has developed successful research collaborations with international and domestic financial services companies and organisations. These help ensure the industry relevance of FMC²'s research.

FMC² works with multiple external partners including Bank of Ireland, Deloitte Ireland, Citibank Europe, The Institute of Banking, Avolon, AerCap, GECAS, SNECMA, SMBC Aviation Capital and KPMG Ireland.

The formal collaboration between this research cluster and the private sector leads creates a benefit-in-kind situation where company sponsorship creates funding for research projects. In turn the companies benefit from research expertise from FMC² members and access to a pipeline of trained quality researchers.

Who are we?

The academic principal investigators and funded investigators involved are: John Cotter (Director, UCD) Don Bredin (UCD) Gregory Connor (Maynooth University) Paolo Guasoni (DCU) Julie Byrne (UCD) Thomas Conlon (UCD) Cal Muckley (UCD) Conall O'Sullivan (UCD) The cluster supports a research cluster manager and a team of postdoc and PhD researchers based at UCD, DCU and Maynooth University.

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www.fmc-cluster.org





Financial Mathematics and Computation Cluster (FMC²)

FMC² is a *research collaboration* between Industry, University College Dublin, Dublin City University and Maynooth University. This research group brings together complementary expertise in *financial mathematics, financial economics and computational finance* to create a holistic research programme in asset and risk management.

In addition to providing support for the innovation activities of Irish-based international financial companies, a pivotal outcome of the activities of FMC² is the creation of a supply of highly skilled personnel, trained postdoctoral researchers and PhD graduates, with world-class quantitative modelling skills who will support the future growth of financial service exports.

FMC² is funded by Science Foundation Ireland's Strategic Partnership programme. The object of this programme is to create partnerships between academia and industry in order to address crucial research questions, and to support the growth of research and development capacity in companies located in Ireland.

•Factor Modelling

VAR

Risk

•Dynamic Factor Structure of European Security Market Return •Risk Measures, Connectivity and Impact on the Real Economy

Pricing Real Assets – Finalization, Policy and Market Implications
Aircraft Finance and Leasing

Valuation
•Energy prices and the Impact on Investment Decisions
•Valuation of contracts with embedded inflation linked options

•Operational Risk – Measurement and Mitigation

•Measuring and mitigating operational risks in financial institutions

•Operational Risk in LIBOR and other Benchmark Markets

•Rogue Trading and Banking

The Vision

The objective of FMC² is to create a globally recognised research centre that will provide a critical underpinning for the future development of the international financial services sector in Ireland.

www.fmc-cluster.org