# Topics in Asset Pricing <br> University of Tokyo <br> Autumn， 2016 <br> Homework \＃3 

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## Topic：Using LYX and Data Software

## Question：

## \＃1．Presenting Data using LYX and Software：

The following data from the World Bank represents the stocks traded within certain nations in the year as a total value of percentage of its GDP over the 20 years．

|  | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Australia | 36.120 | 34.486 | 38.952 | 51.151 | 51.385 | 63.566 | 73.807 | 90.419 | 88.939 | 88.399 |
| USA | 85.992 | 107.632 | 135.384 | 194.767 | 289.574 | 196.610 | 155.344 | 139.393 | 155.627 | 196.981 |
| Japan | 25.269 | 24.104 | 26.707 | 45.768 | 52.440 | 40.914 | 43.523 | 54.099 | 74.266 | 94.878 |
| China | 35.749 | 38.726 | 27.738 | 18.809 | 62.442 | 34.737 | 23.135 | 23.516 | 26.342 | 17.296 |

Table 1：Stocks Traded，Total Value（\％of GDP）1996－2005

|  | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Australia | 115.004 | 160.982 | 79.629 | 90.817 | 99.045 | 81.191 | 58.906 | 50.3776 | 48.360 | 56.037 |
| USA | 220.713 | 295.992 | 320.992 | 237.929 | 240.741 | 264.504 | 200.241 | 199.526 | 224.674 | 230.671 |
| Japan | 126.207 | 151.178 | 128.036 | 76.823 | 77.660 | 72.944 | 56.174 | 123.922 | 105.408 | 135.124 |
| China | 42.457 | 178.975 | 85.667 | 154.776 | 136.725 | 89.076 | 59.412 | 81.091 | 115.537 | 361.903 |

Table 2：Stocks Traded，Total Value（\％of GDP）2006－2015

Using these data figures and inserting them into the software program Mathematica we can graphically represent the data.


Figure 1: Stocks Traded, Total Value (\% of GDP) 1996-2015

The following data shows intriguing trends as to how much emphasis a nations financial market places on security trading in comparison to its GDP. The US shows the strongest emphasis on stock trading in comparison to the other nations as since 1997 it has always traded stocks valued over $100 \%$ its GDP peaking at $321 \%$ in 2008. Japan and Australia have had similar looking trends generally trading around $70 \%-80 \%$ of stock value compared to GDP and only spiking over $100 \%$ leading into the GFC of 2007-2008. China has a steady trend however from 2014-2015 spiked its stocks traded by over $200 \%$ with it trading $362 \%$ of its GDP value in stocks in 2015 . Using Mathematica we can determine the mean over the 20 years for each of the countries as to how much average financial emphasis they place on their stock trading in respects to GDP.


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    Australia Mean Stocks Traded as % of GDP 1996-2015
In[25] = Mean[{36.1204159, 34.4861454, 38.9521626, 51.1506691, 51.3850596, 63.5656939, 73.8073868, 90.4194775, 88.9385561, 88.3986838,
            115.004123, 160.981691, 79.6290146, 90.817391, 99.0445917, 81.1905423, 58.9059382, 50.3776225, 48.3603264, 56.036913}]
Out[25]= 72.8786
    USA Mean Stocks Traded as % of GDP 1996-2015
In[32]= Mean[{85.99164391, 107.6323396, 135.3835335, 194.7671776, 289.5739977, 196.6101076, 155.3435623, 139.3931318, 155.627176, 196.9813001,
    220.7132231, 295.9915435, 320.9921703, 237.9291333, 240.7409957, 264.5040788, 200.2411298, 199.5255009, 224.674233, 230.6709266}]
Out[32]= 204.664
    Japan Mean Stocks Traded as % of GDP 1996-2015
    Mean[{25.26912271, 24.10406949, 26.70736517, 45.76757655, 52.43965294, 40.91352602, 43.52344622, 54.09921196, 74.26614976, 94.87763383,
    126.2074912, 151.1777852, 128.0361293, 76.82295399, 77.65986605, 72.94449582, 56.17378041, 123.9220979, 105.4078631, 135.1244035}]
Out[33]= 76.7722
    China Mean 1996-2015
In[27]= Mean[{35.74852876, 38.72579973, 27.73786276, 18.80891678, 62.44152103, 34.73708447, 23.13473555, 23.51627896, 26.34206713, 17.29555186,
    42.4572463, 178.9747162, 85.66670368, 154.7761808, 136.7253186, 89.07634935, 59.41175899, 81.09054129, 115.5366633, 361.9032739}]
Qut[27]= 80.7054
```

Figure 2: Average Values of Stocks Traded/Total Value (\% of GDP) for each country 1996-2015

The average values amongst China, Japan and Australia differ only slightly, even despite the Chinese outlier value of 2015 , all valuing at around $70-80 \%$. However as stated the US averages its value of stocks traded at roughly $204 \%$ of its GDP total value over the past 20 years. This illustrates the immense financial value of stocks traded within the US as it trades stocks on average double the value of its GDP which has increased from $\$ 8.1$ trillion US in 1996 to \$17.947 trillion US in 2015.

Another interesting point of data to investigate is whether financial crises or events within a certain time period affected the percentage of stocks traded within nations. Taking again the 4 respective nations we measure the averages of its stocks traded in each year from 1996.

| Averages Yearly.nb - Wolfram Mathematica 11.0 | - $\times$ | Juverages Yearly .nb - Wolfram Mathematica 11.0 - | ㅁ $\times$ |
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| H(3) $)=$ Mean $[$ [ $36.12041591,35.74852876,25.26912271,85.99164391]]$ | 37^ | $\underline{\mathrm{ln}}(\underline{5})=\mathrm{Mean}[\{115.0041234,42.4572463,126.2074912,220.7132231\}]$ |  |
| $O_{0}(\mathbf{t} 5)=45.7824$ | $3]$ | Ou(5) $=126.096$ | 3] |
| InP3) = Mean [\{34.48614542, 38.72579973, 24.10406949, 107.6323396]] | ] | $1 \mathrm{l}(5)=$ Mean [ $\{160.9816997,178.9747162,151.1777852,295.9915435\}]$ | 3] |
| Ou(t) 51.2371 | $9]$ | Ouy $(5)=196.781$ | ]. |
| In40] $=$ Mean [ $388.95216259,27.73786276,26.70736517,135.3835335]]$ | $3]$ | $\mid \mathrm{m}(84)=$ Mean $[$ [ $79.62901461,85.66679368,128.0361293,320.9921703\}]$ | 3] |
| $O_{0}(4)=57.1952$ | $3]$ | Oulsf) 153.581 | 3. |
| In4 42$]=$ Mean [ $51.15066913,18.88891678,45.76757655,194.7671776]]$ | ] | $\mid 1[5]\}=$ Mean [\{90.81739995, 154.7761808, $76.82295399,237.9291333\}]$ |  |
| Onal\|l2] 77.6236 | 9] | $\mathrm{orus}_{(5)}=140.086$ |  |
| Intal $=$ Mean $[\{51.38505959,62.44152103,52.43965294,289.5739977]]$ | 37 | $\mid 1(53)]=$ Mean $[$ [ $99.04459167,136.7253186,77.65986605,240.7409957]]$ |  |
| $O_{\text {arlez }}$ ) 113.96 | $3]$ |  | $3]$ |
| Intey $=$ Mean [ $663.56569394,34.73798447,40.91352602,196.6101976]]$ | 97 | In[5] $=$ Mean [ $[81.19954228,89.07634935,72.94449582,264.5049788]]$ | 71 |
| Ouf(e) $=83.9566$ | $3]$ | Outbil 126.929 | $3]$ |
| Infeol $=$ Mean [ $[73.88738679,23.13473555,43.52344622,155.3435623]]$ | $3]$ | 1 l (5) $)=$ Mean [ $[58.99593816,59.41175899,56.17378941,200.2411298\}]$ | $3]$ |
| $O$ Of(0) $=73.9523$ | 3] | $0 \mathrm{O}(\mathrm{t} 5)=93.6832$ |  |
| Incts) $=$ Mean [ $990.41947754,23.51627896,54.09921196,139.3931318]]$ | 31 | $14048)=$ Mean [ $550.37762248,81.09054129,123.9229979,199.5255009\}]$ | 37 |
| Ouftel 76.857 | $3]$ | Oratel) 113.729 | 3] |
| Ins(b) $=$ Mean [ [88.93855614, 26.34206713, 74.26614976, 155.627176\}] | 97 | $\operatorname{In}(4)=$ Mean $[488.3603264,115.5366633,105.4078631,224.674233\}]$ | 3] |
| Our(s) $=86.2935$ | $3]$ | Or(t) $=123.495$ | 3] |
| $\mid$ \|n5] $)=$ Mean [ $[88.39868384,17.29555186,94.87763383,196.9813001]]$ |  | Indeb] $=$ Mean [\{56.03691304, 361.9032739, 135.1244035, 230.6709266] | ] |
| Ou(b) $=99.3883$ |  | Ont(0) $=195.934$ |  |
|  | 100\% - |  | 100\% - |

Figure 3: Average Values of Stocks Traded/Total Value (\% of GDP) yearly 1996-2015
Now taking the averages and graphing them yearly from 1996 of the 4 countries;


Figure 4: Average Value of Stocks Traded/Total Value (\% of GDP) of AUS, USA, JPN and CHN 1996-2015:

From the data there does seem to be distinctive correlation between falls in stocks traded to financial crises. The Dot-com bubble went through the typical boom and bust cycle from 1995-2001. Correspondingly leading to the GFC of 2007-2008 the U.S. housing bubble peaked in 2004 but from there it began to cause the values of securities tied to U.S. real estate pricing to drastically plummet. Thus in times of such financial crises we can expect for stock trading firms and consumers to be more risk-averse due to financial instability and the number of stocks to be traded to decrease. There seems now to be a resurgence in stock trading especially as I mentioned in China. The average value of stocks traded as total value \% of GDP is almost back the level it was in 2004. Perhaps we can expect another financial crises in the near future from another blooming asset bubble?

## References

[1] World Federation of Exchanges database. Stocks traded, total value (\% of GDP). The World Bank. 2016. [http://data.worldbank.org/indicator/CM.MKT.TRAD.GD.ZS] Oct. 142016.
[2] World Bank national accounts data, OECD National Accounts data files. USA GDP (current \$US). The World Bank. 2016. [http://data.worldbank.org/indicator/NY.GDP.MKTP.CD?end=2015\&locations=US\&start=1996] Oct. 152016.
[3] Software used: LYX, Mathematica, Mendeley, Grammarly.com.

