Databinding – The Matrix

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Sicily 2015
What is Databinding?

- A way of sharing data with (typically) the GUI element of an application
- Facilitates MVVM
  - “Model View ViewModel”
  - Which is just a way of separating your “logic” from your “UI”
- It can be “two-way”. Changes in the GUI can update your data (with notification)
How does it work? (in .NET)

- A “databinding source” is just a thing that implements a number of .NET interfaces
- We can create “databinding sources” for …
How does it work? (in .NET)

• A scalar (e.g. number, “string”):
  – INotifyPropertyChanged
    • and others
  – And of course the value itself
How does it work? (in .NET)

• A vector:
  – IList
  – ICollection
  – IEnumerable
    • and others
How does it work? (in .NET)

• A namespace
  – For each scalar variable (e.g. number, “string”):
    • INotifyPropertyChanged
    • And of course, the value itself
  – Or (if it’s a vector)
    • IList
    • ICollection
    • IEnumerable
    – And others
How does it work? (in .NET)

• A matrix?
  – Is just a collection of rows – like a vector
    • IList
    • ICollection
    • IEnumerable
    – and others
  – A row is essentially just an object in a collection
How does it work? (in .NET)

• A row
  – For each column:
    • INotifyPropertyChanged
    • And of course, the value itself
  – Or (if it’s a vector, or a matrix)
    • IList
    • ICollection
    • IEnumerable
How does it work? (in .NET)

• A matrix?
  – A row is essentially just an object in a collection
    • It has named columns
  – In just the same way as a namespace in a vector is just an object in a collection
    • which has named properties

• The “consumer” of your data doesn’t care (or even know) that it’s a matrix in the workspace
I’m not good with data

• No CDDB (well not for the first 10 minutes)
• Historical share prices
  – Date
  – Open
  – Close
  – High
  – Low
  – Volume
### Share Prices

<table>
<thead>
<tr>
<th>Date</th>
<th>Open</th>
<th>High</th>
<th>Low</th>
<th>Close</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2/2002</td>
<td>429</td>
<td>421</td>
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<tr>
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<td>418</td>
<td>32207</td>
<td></td>
</tr>
</tbody>
</table>

### namespaces

```python
pns_pah3
3466

10↑ns_pah3(Date Open High Low Close Volume)
```

<table>
<thead>
<tr>
<th>Date</th>
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<th>Close</th>
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</thead>
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<td>418</td>
<td>418</td>
<td>32207</td>
<td></td>
</tr>
</tbody>
</table>

### matrix

```python
ppah3
3466 6
```

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<th>Low</th>
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<td></td>
</tr>
</tbody>
</table>
## Share Prices

### namespaces

<table>
<thead>
<tr>
<th>Column</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close</td>
<td>64.2</td>
</tr>
<tr>
<td>Date</td>
<td>69.05</td>
</tr>
<tr>
<td>High</td>
<td>64.2</td>
</tr>
<tr>
<td>Low</td>
<td>69.05</td>
</tr>
<tr>
<td>Open</td>
<td></td>
</tr>
<tr>
<td>Volume</td>
<td></td>
</tr>
</tbody>
</table>

### matrix

<table>
<thead>
<tr>
<th>Column0</th>
<th>Column1</th>
<th>Column2</th>
<th>Column3</th>
<th>Column4</th>
<th>Column5</th>
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</thead>
<tbody>
<tr>
<td>64.2</td>
<td>69.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ns_pah3[0]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pah3[0;3 2]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

```plaintext
src←(2015 ⌷) 'ns_pah3'
sr.Count
3466
↑sr[0].⎕nl -2
Close
Date
High
Low
Open
Volume

src[0].(Low High)
64.2 69.05

ns_pah3[0].(Low High)
64.2 69.05
```

```plaintext
src←(2015 ⌷) 'pah3'
sr.Count
3466
↑sr[0].⎕nl -2
Column0
Column1
Column2
Column3
Column4
Column5

src[0].(Column3 Column2)
64.2 69.05
pah3[0;3 2]
64.2 69.05
```
# Share Prices - matrices

<table>
<thead>
<tr>
<th>Date</th>
<th>Open</th>
<th>High</th>
<th>Low</th>
<th>Close</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>03/01/2002</td>
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<tr>
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<td>30076</td>
</tr>
</tbody>
</table>
Share Prices

namespaces

```
src←info
↑src
[0].⎕nl
¯2
Close
Date
High
Low
Open
Volume
src[0].(Low High)
64.2 69.05
ns_pah3[0].(Low High)
64.2 69.05
```

matrix

```
info
Date   (System.String)
Open   (System.Double)
High   (System.Double)
Low    (System.Double)
Close  (System.Double)
Volume (System.Double)
```

```
src info (2015 I) 'pah3'
↑src[0].⎕nl
¯2
Close
Date
High
Low
Open
Volume
src[0].(Low High)
64.2 69.05
pah3[0;3 2]
64.2 69.05
```
Share Prices

namespaces

```plaintext
dg←⎕new DataGrid
dg.DataContext←src
```

matrix

```plaintext
dg←⎕new DataGrid
dg.DataContext←src
```
Summary

• A way of sharing data with (typically) the GUI element of an application
• A “databinding source” is just a thing that implements a number of .NET interfaces
• So anything that knows about these interfaces can see the data.
  – csharp_function(ILList list);
Summary

- Matrix data is equivalent to a vector of rows (AKA objects, AKA namespaces)
- The “consumer” of your data doesn’t care (or even know) that it’s a matrix in the workspace
- In fact, as long as we implement the required interfaces, we can provide the data in any way we like.
Demo