Department of Electrical and Electronic Engineering, HKUST

Final Year Project (2003-2004)

Financial Data Analysis/Prediction based on Filter Bank Decomposition (BZ3-03)

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Think of the billions of business transactions going on every day in the stock market, would it be wonderful if we could predict future market price of a stock? This idea had motivated the proposal of our project – to predict future price of a stock given its past recorded prices.

*The methodology is to combine traditional predictor with filter bank decomposition in order to make better predictions.* In other words, its predictions have a smaller mean square error (MSE) or mean absolute error (MAE).

A software package, which is a graphical user interface (GUI), has been developed in MATLAB. The interface includes all the necessary functions to import data, decompose the data and comparing the direct approach in figure 1 with the decomposed approach in figure 2.
**Block Diagrams**

**Figure 1:** The direct approach (for example, linear predictor)

- $X(n)$: input financial data
- $Y(n)$: predicted data sequence
- $P$: predictor

**Figure 2:** The decomposed approach, with M channels decomposition

- $M$: moving average filter to remove trend
- $H_i$: the $i^{th}$ analysis filter, for $0 \leq i \leq M-1$
- $P_i$: the $i^{th}$ predictor (e.g., linear predictor)
- $Y(n)$: predicted sequence

**Figure 3:** M channels decomposition process

- $X_i(n)$: reconstructed financial data
- $X(n)$: input financial data

For perfect reconstruction, $X_i(n) = X(n)$ for all values of $n$
Results

<table>
<thead>
<tr>
<th></th>
<th>Without decomposition</th>
<th>With decomposition</th>
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<tbody>
<tr>
<td><strong>MAE</strong></td>
<td>0.298</td>
<td>0.053</td>
</tr>
<tr>
<td><strong>MSE</strong></td>
<td>0.22</td>
<td>0.01</td>
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**Figure 4:** A simulation example, with 16 channels filter bank

**Figure 5:** The Graphical User Interface (GUI)