

# Dependency Parsing Example

## 0. In general

- Start with ROOT on **Stack**, **Buffer** with whole sentence
- If there is nothing on the stack, you must **shift**
- If the top of the stack is the child of the top of the buffer, then make a **left** arc. Child is the modifier word. The arrow points to the child
- If the top of the **Buffer** is a child of the top of the **Stack**, and the top of the **Buffer** has no children that have yet to be added to the tree, then make a **right** arc

## 1. Initial state:

**Stack**

[root    ]

**Buffer**

[economic, news, had, little, effect,  
on, financial, markets, .]

ROOT   Economic   news   had   little   effect   on   financial   markets   .

Next transition: 1. Shift

In actual application, a decision needs to be made at every step among the three actions: shift, left, or right.

## 2. At the beginning, we have no choice but shifting economic from the top of the **Buffer** to **Stack**.

**Stack**

[root , **economic**    ]

**Buffer**

[news, had, little, effect, on, financial,  
markets, .]

ROOT   Economic   news   had   little   effect   on   financial   markets   .

Next transition: 2. Left

## 3. Then we can do a left action to draw an arc from news to economic as economic is a modifier for news.

### Stack

[root    ]

### Buffer

[news, had, little, effect, on, financial, markets, .]

ROOT   Economic ← news   had   little   effect   on   financial   markets   .

Next transition: 3. Shift

**4. Now we have nothing on the Stack again and we have to make a shift.**

### Stack

[root , news   ]

### Buffer

[had, little, effect, on, financial, markets, .]

ROOT   Economic ← news   had   little   effect   on   financial   markets   .

Next transition: 4. Left

**5. As we can see, the word news is on the top of the Stack. Since news is the subject of the verb had, we can create a left arc from had to news.**

### Stack

[root    ]

### Buffer

[had, little, effect, on, financial, markets, .]

ROOT   Economic ← news ← had   little   effect   on   financial   markets   .

Next transition: 5. Shift

**6. Now the Stack is empty again. We need to do a shift.**

### Stack

[root , had ]

### Buffer

[little, effect, on, financial, markets, .]

ROOT Economic ← news ← had little effect on financial markets .

Next transition: 6. Shift

**7. Here we have different possible actions and the most appropriate one is to shift the word little to Stack.**

### Stack

[root , had , little ]

### Buffer

[effect, on, financial, markets, .]

ROOT Economic ← news ← had little effect on financial markets .

Next transition: 7. Left

**8. Here we can add an left arc from effect to little.**

### Stack

[root , had ]

### Buffer

[effect, on, financial, markets, .]

ROOT Economic ← news ← had little ← effect on financial markets .

Next transition: 8. Shift

**9. Now we are going to shift again to put effect to the top of Stack.**

### Stack

[root , had , effect ]

### Buffer

[on, financial, markets, .]

ROOT Economic ← news ← had little ← effect on financial markets .

Next transition: 9. Shift

**10. And we are going to shift yet again.**

### Stack

[root , had , effect ]

### Buffer

[on, financial, markets, .]

ROOT Economic ← news ← had little ← effect on financial markets .

Next transition: 9. Shift

## 11. And again.

### Stack

[root , had , effect , on ]

### Buffer

[financial, markets, .]

ROOT Economic ← news ← had little ← effect on financial markets .

Next transition: 10. Shift

## 12. And even further.

### Stack

[root , had , effect , on , financial ]

### Buffer

[markets, .]

ROOT Economic ← news ← had little ← effect on financial markets .

Next transition: 11. Left

## 13. Here we can put an arc between financial and markets.

### Stack

[root , had , effect , on ]

### Buffer

[markets, .]

ROOT Economic ← news ← had little ← effect on financial ← markets .

Next transition: 12. Right

**14. From now on, we can start creating right arcs. Here, on is a preposition and the object of the preposition is financial markets. We draw the arc to the noun phrase. Now we have the preposition phrase "on financial markets".**

**Stack**

[root , had , effect ]

**Buffer**

[on, .]

ROOT   Economic ← news ← had   little ← effect   on   financial ← markets   .

Next transition:                      13. Right

**15. Next, we can draw another right arc from effect to on.**

**Stack**

[root , had ]

**Buffer**

[effect, .]

ROOT   Economic ← news ← had   little ← effect → on   financial ← markets   .

Next transition:                      14. Right

**16. Since we have effect on the top of the buffer, we can draw a right arc from had to effect because had is a helper word for effect.**

**Stack**

[root     ]

**Buffer**

[had, .]

ROOT   Economic ← news ← had   little ← effect → on   financial ← markets   .

Next transition:                      15. Shift

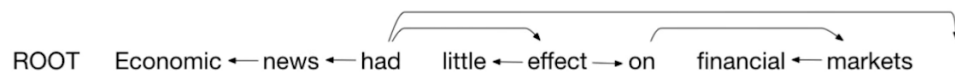
**17. Then, we shift had to the stack and this allows us to create a right arc going from had to the sentence final punctuation.**

Stack

[root    ]

Buffer

[had]



Next transition:

17. Right

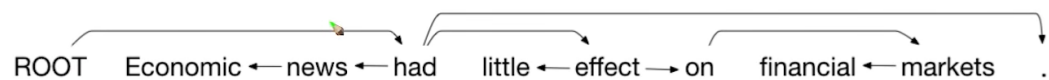
**18. The very last thing is to connect the ROOT to the main verb.**

Stack

[root    ]

Buffer

[]



Next transition:

Reference: Dependency Parsing: Shift-Reduce Models by Jordan Boyd-Graber, available from <https://www.youtube.com/watch?v=f5-hTA9hA3s>