# ICEACE Reference Manual

Bulent Ozel - bulent.ozel@gmail.com

April 26, 2013

## Contents

# 1 ICEACE FLAME Implementation

## 1.1 firm

Table 1: **List of memory variables for firm agent.**

| Name | Description |
| --- | --- |
| int id | Agent ID. |
| int isconstructor | Identifies if the firm is a constractor firm or not. |
| int day_of_month_to_act | The day of the month to act at production and labour. |
| int day_of_week_to_act | Day of the week to act for consumption. |
| int_array employees | Holds employee ids |
| double wage_offer | Monthly wage offer. |
| int no_employees | Number of employees |
| int vacancies | Number of vacancies |
| int employees_needed | Number of workers a firm needs for next production |
| int day_of_month_wages_paid | The day of the month wages paid. |
| double labour_productivity | Productivity of a unit labour. |
| int production_current | Total number of goods produced in current month. |
| int production_estimate | An estimate of production for incoming period. |
| int production_plan | Production plan for next month. |
| double unit_goods_price | Price of a unit of goods produced by a firm. |
| int day_of_month_production_completed | The day of the month amount of production is computed. |
| double unit_house_price | Unit price of an house. |
| double labour_productivity_construction | Productivity of a unit labour in construction sector. |
| double capital_productivity_construction | Capital productivity in construction sector. |
| double capital_construction | Upper amount of constraction capital in housing. |
| int projects | Holds projects under construction. Indices denote number of months left for completion. |
| double debt | Total debt of the firm. |
| int inventory | Unsold inventory from previous month. |
| int sales | Total number of sales within a month. |
| double costs | Total production and operation costs. |
| double equity | Firm equity. |

**Table 1 – continued from previous page**

| Name | Description |
|---|---|
| double liquidity | Liquidity. |
| double capital_goods | Capital Goods. |
| double price_unit_product | Unit price of the product made by the firm. |

Table 2: **List of functions for firm agent.**

| Name | Description |
|---|---|
| firm_init | Notifies its id. |
| idle | It is not the day of the week to sell. |
| firm_consumption_supply | A firm ships its goods to malls. |
| firm_consumption_recieve_sales | A firm recieves goods unsold and sales liquidity from the mall. |
| idle | Labour hiring is not active. |
| firm_labour_workforce_needed | The firm computes required number of employees needed for incoming month. |
| idle | Firm does nothing |
| firm_labour_fire | The firm decides to fire if employee needed is below number of employees it does have. |
| firm_labour_job_announcement_stage1 | The agent posts available positions. |
| firm_labour_job_offer_stage1 | The agent takes job matches done by jpoffice. |
| firm_labour_update | The agent updates labour status. In case of resignments. |
| firm_labour_job_announcement_stage2 | The agent posts unfilled positions. |
| idle | The agent has no vacant positions |
| firm_labour_job_offer_stage2 | The agent completes the job placement. |
| idle | Does nothing at the point when it is not last day of the month. |
| firm_labour_pay_wages | Pay wages and update liquidity. |
| idle | It is not the end of month or the first day of the month. |
| idle | The state serves to differentiate regualar and constructor firms. |
| idle | Sets a producer role. |
| idle | Set the constructor role. |
| firm_production_produce_goods | Firm audits number of items produced. Updates inventory accordingly. |

Table 2 – continued from previous page

| Name | Description |
| --- | --- |
| firm_production_set_price | Firm sets price of goods produced. |
| firm_production_plan | Firm determines number of items to be produced for the next period. |
| firm_production_compute_labour_demand | Firm determines required number of labourers for current production plan. |
| firm_production_construct_houses | Firm releases number of items produced. Updates project status accordingly. |
| firm_production_construction_plan | Firm sets the construction project plan. |
| firm_production_construction_labour_demand | Firm determines required number of labourers for current construction plan. |
| idle | It is not the end/start of a quarter. |
| firm_accounting_distribute_net_income | At the end of a quarter sends net income to the fund. |
| firm_accounting_do_balance_sheet | Updating the balance sheet. |

## 1.2 household

Table 3: **List of memory variables for household agent.**

| Name | Description |
| --- | --- |
| int id | Agent ID. |
| int day_of_week_to_act | Day of the week to act for consumption. |
| int my_employer_id | Employer ID of an household. A 0 means unemployed. |
| double wage | Current wage earned. |
| int day_of_month_to_act | The day of the month to act for seeking a job. |
| int day_of_month_wage_recieved | The day of the month to wage recieved. |
| double total_assets | Total assets. |
| double mortgages | Total mortgage. |
| double housing_payment | Holds total mortgage payment done within the last quarter. |
| double equity | Household equity. |
| double housing_price | Market value of a unit housing. |
| int housing_units | Number of housing units owned by a household. |
| double liquidity | Liquidity. |
| double fund_shares | Equity fund shares. |

**Table 3 – continued from previous page**

| Name | Description |
| --- | --- |
| int previous_wages | Holds wages earned in three previous months. |
| double net_income | Holds net income within last quarter. |
| double weekly_consumption_budget | Weakly consumption budget for next quarter. |

Table 4: **List of functions for household agent.**

| Name | Description |
| --- | --- |
| household_init | Notifies its id.. |
| idle | It is not the day of the week to shop. |
| household_consumption_demand | A household demands a consumption amounted to the available budget he/she has. |
| household_consumption_recieve_goods | A household recieves goods bought from the mall. |
| idle | Job searching is not active. |
| household_labour_check_fired | Household checks layout status. |
| household_labour_reemployment_application | Stage 01 of job applications. Already employed households apply with a turnover probability |
| idle | Stage 01 of job applications. Unemployed households skip this stage |
| household_labour_turnover | A job turnover. |
| household_labour_employment_application | Stage 02 of job market. Unemployed households apply. |
| household_labour_employment | A new employment. |
| idle | Does nothing at the point when it is not last day of the month. |
| household_labour_recieve_wage | Recieves payment and update wage history. |
| idle | It is not the end/start of a quarter. |
| household_accounting_collect_shares | At the end of a quarter household recieves shares from the firms via Equity Fund. |
| household_accounting_compute_net_income | Computing quarterly net income. |
| household_accounting_wealth_effect | Computing calculating the wealth effect. |
| household_accounting_do_balance_sheet | Computing the balance sheet. |

## 1.3   equityfund

Table 5: **List of memory variables for equityfund agent.**

| Name | Description |
| --- | --- |
| int id | Agent ID. |
| double share_firms | Shares owned by regular firms. |
| double share_construction_firms | Shares owned by constructor firms. |
| double share_banks | Shares owned by banks. |
| double equity | Firm equity. |
| double liquidity | Liquidity. |
| int n_households | Number of households to recieve liquid shares from firm net income. |

Table 6: **List of functions for equityfund agent.**

| Name | Description |
| --- | --- |
| equityfund_init | Notifies its id. |
| idle | It is not the end/start of a quarter. |
| equityfund_accounting_collect_firm_shares | At the end of a quarter collect net income from the firms in the market. |
| equityfund_accounting_distribute_shares | At the end of a quarter net income per household is distributed. |
| equityfund_accounting_do_balance_sheet | Equity fund balance sheet accounting activities. |

## 1.4 bank

Table 7: **List of memory variables for bank agent.**

| Name | Description |
| --- | --- |
| int id | Agent ID. |
| double loans | loans to firms. |
| double mortgages | Mortgages to households. |
| double deposits | Deposits recieved from private sector. |
| double debt | Debt to central bank. |
| double equity | Firm equity. |
| double liquidity | Liquidity. |

Table 8: **List of functions for bank agent.**

| Name | Description |
|---|---|
| bank_init | Notifies its id. |
| idle | It is not the end/start of a quarter. |
| bank_accounting_do_balance_sheet | Bank balance sheet accounting activities. |

## 1.5  government

Table 9: **List of memory variables for government agent.**

| Name | Description |
|---|---|
| int id | Agent ID. |
| double debt | Debt to central bank. |
| double equity | Government equity. |
| double liquidity | Government liquidity. |

Table 10: **List of functions for government agent.**

| Name | Description |
|---|---|
| government_init | Notifies its id. |
| idle | It is not the end/start of a quarter. |
| government_accounting_do_balance_sheet | Government balance sheet accounting activities. |

## 1.6  centralbank

Table 11: **List of memory variables for centralbank agent.**

| Name | Description |
|---|---|
| int id | Agent ID. |
| double liquidity | Central Bank liquidity |
| double loans_banks | loans to firms. |
| double loans_government | loans to the government. |
| double fiat_money | Outstanding fiat money. |

Table 11 – continued from previous page

| Name | Description |
| --- | --- |
| double equity | Firm equity. |
| double liquidity_banks | Liquidity kept for banks. |
| double liquidity_government | Liquidity kept for the government. |

Table 12: **List of functions for centralbank agent.**

| Name | Description |
| --- | --- |
| centralbank_init | Notifies its id. |
| idle | It is not the end/start of a quarter. |
| centralbank_accounting_do_ balance_sheet | Central Bank balance sheet accounting activities. |

## 1.7 mall

Table 13: **List of memory variables for mall agent.**

| Name | Description |
| --- | --- |
| int id | Agent ID. |
| int day_of_week_to_act | Day of the week to act for consumption. |

Table 14: **List of functions for mall agent.**

| Name | Description |
| --- | --- |
| idle | It is not the day of the week to shop. |
| mall_consumption_shopping | Mall collecting supplies from the firms, demands from the households. |

## 1.8 jpoffice

Table 15: **List of memory variables for jpoffice agent.**

| Name | Description |
| --- | --- |
| int id | Agent ID. |
| int day_of_month_to_act | The day of mont to perform job matching. |

Table 16: **List of functions for jpoffice agent.**

| Name | Description |
| --- | --- |
| idle | Job matching is not active. |
| jpoffice_labour_stage1 | Collecting vacancies and job applications. Vacancies and turnover applications are matched. |
| jpoffice_labour_stage2 | Second stage job matching. |

## 1.9 Messages

See Table 17.

Table 17: **List of messages.**

| Name | Description |
| --- | --- |
| buy | Weekly household consumption information. |
| int id | Household agent ID. |
| double budget | Amount of liquid money to spend. |
| bought | Consumption summary. |
| int id | Household agent ID. |
| double money_left | Amount of liquid money that was not spent. |
| int recieved_quantity | Number of goods bought. |
| sell | Information on items to be sold at the mall. |
| int id | Firm agent ID. |
| double price | Unit price of goods to be sold. |
| int inventory | Number of items to be sold. |
| sold | Sales summary. |
| int id | Firm agent ID. |
| int unsold_quantities | Number of unsold quantities. |
| fired | Sent by a firm to notify an employee who is fired. |
| int employee_id | Employee ID who has been fired. |
| vacancy_stage1 | Sent by a Firm to post a vacancy. |
| int employer_id | Firm agent ID who posts a new position. |
| double wage | Amount of salary to be offered. |
| job_application_stage2 | Sent by an household to apply a posted vacancy. |
| int employee_id | Household agent ID who seeks employment. |
| job_application_stage1 | Sent by an household to notifie jpoffice |
| int employee_id | Household agent ID who applies for a new job. |
| double wage | Current amount of wage earned by the applicant. |
| job_match_stage1 | Sent by a firm informing a filled position. |
| int employer_id | Firm agent ID that has filled a post. |
| int employee_id | Household agent ID who has been offered a position. |
| double wage | Amount of salary that is offered. |

**Table 17 – continued from previous page**

| Name | Description |
|---|---|
| job_change | Sent by a worker to notify a resigned position. |
| int employer_id | Firm agent ID of the position held. |
| int employee_id | Household aent ID who is changing the job. |
| vacancy_stage2 | Sent by a Firm to post unfilled vacancy. |
| int employer_id | Firm agent ID who posts unfilled position. |
| double wage | Amount of salary to be offered. |
| job_match_stage2 | Sent by a firm informing a filled position. |
| int employer_id | Firm agent ID that has filled a post. |
| int employee_id | Household agent ID who has been offered a position. |
| double wage | Amount of salary that is offered. |
| firm_net_income | Net income send to Equity Fund. |
| int id | Firm agent ID. |
| int isconstructor | Flag to label whether the income is recieved from a constructor firm. |
| double net_income | Net income to be distributed. |
| household_share | Shares are sent to households. |
| double amount | Share per household. |

## 1.10 Constants

Table 18: **List of constants.**

| Name | Description |
|---|---|
| double turnover_probability | A probability of a uniform distribution that determines turnover rate. |
| double production_markup | Rate of increase in production by firms. |
| double price_markup | Rate of increase set by firms on prices. |
| double firm_memory_persistance | A parameter holding to what extend firms previous sale history play on final production decision. |
| double housing_expenditure | A threshold value denoting expenditure on housing as a proportion of total income. Used by Household agents. |
| double ratio_debt_firm | Ratio of debt to be paid by a firm. |
| double wealth_effect | A rate of influence from housing market to regular economy. Used by Household Agents. |

## 1.11 Datatypes

Table 19: **List of attributes for ADTs.**

| Name | Description |
|---|---|
| buyer | Consumer data. |
| int id | Id of the household agent. |

Table 19 – continued from previous page

| Name | Description |
| --- | --- |
| double budget | Consumption budget to go. |
| int recieved_quantity | Number of items bought. |
| seller | Seller data. |
| int id | Id of the firm agent. |
| double price | Unit price of goods to be sold. |
| int inventory | Number of items available for sale. |
| vacancy | Firm vacancy information. |
| int id | Id of the firm agent. |
| double wage | Wage offered by the firm that holds the vacancy. |
| employee | Job applicant data. |
| int id | Id of the household agent. |
| double wage | Current wage of the job applicant. |