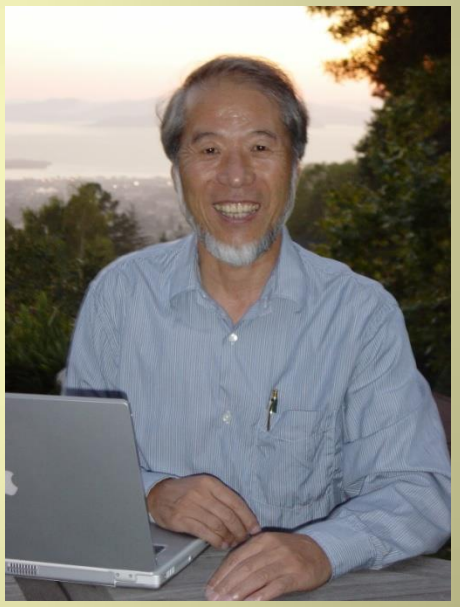
Accounting System Dynamics
(Module 6 & 7)



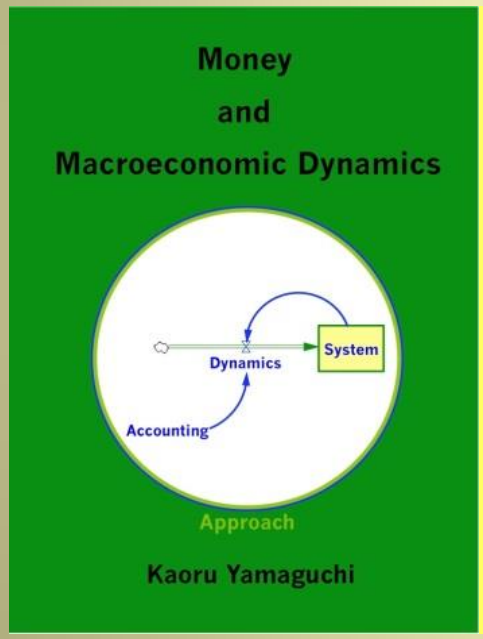
Instructor

Kaoru Yamaguchi, Ph.D.

Module Overview

It is essential for business people to understand the structure of financial reports consisting of income statement, balance sheet and cash flow statement. With the application of stock-flow concept of simple dynamics, the understanding of financial reports becomes very simple and easy. This method is proposed by Prof. K. Yamaguchi as accounting system dynamics – a foundation of business modeling in this course.

Suggested Reading(A)



Money and Macroeconomic Dynamics
– Accounting System Dynamics Approach –

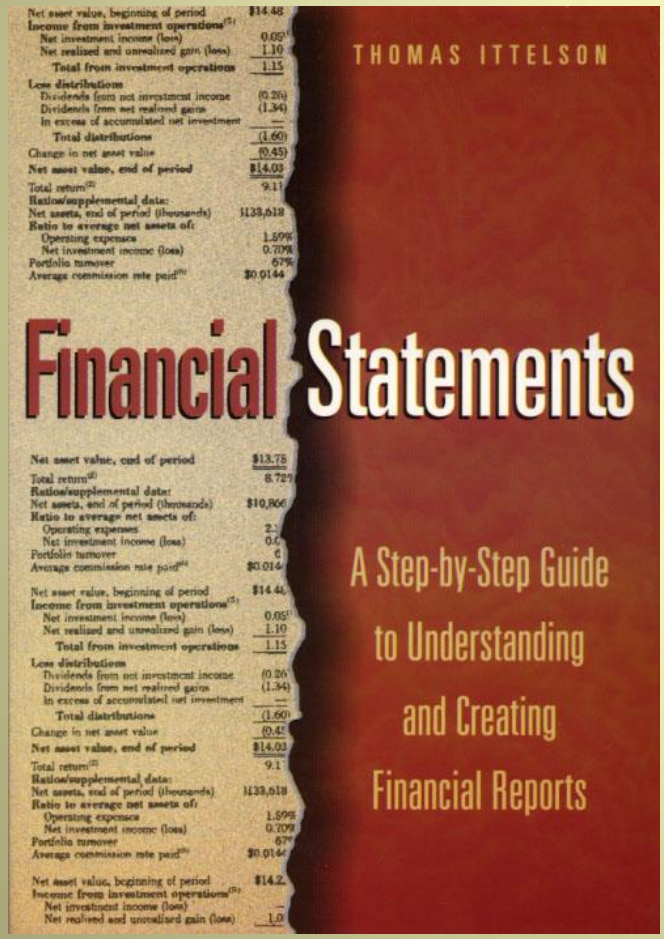
by Kaoru Yamaguchi, 2013

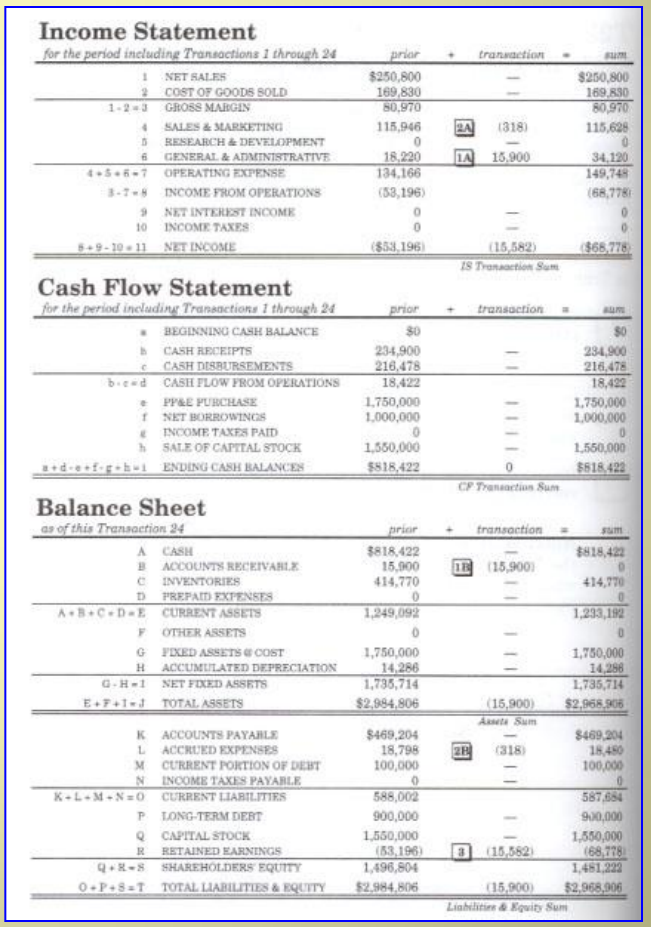
Chapter 3: Accounting System Dynamics

Suggested Reading (B)

"Financial Statements"

by Thomas Ittelson, Career Press, 1998





Income Statement

for the period including Transactions 1 through 24

		prior	+	transaction	=	sum
1	NET SALES	$250,800		—		$250,800
2	COST OF GOODS SOLD	169,830		—		169,830
1 - 2 = 3	GROSS MARGIN	80,970				80,970
4	SALES & MARKETING	115,946	2A	(318)		115,628
5	RESEARCH & DEVELOPMENT	0		—		0
6	GENERAL & ADMINISTRATIVE	18,220	1A	15,900		34,120
4 + 5 + 6 = 7	OPERATING EXPENSE	134,166				149,748
3 - 7 = 8	INCOME FROM OPERATIONS	(53,196)				(68,778)
9	NET INTEREST INCOME	0		—		0
10	INCOME TAXES	0		—		0
8 + 9 - 10 = 11	NET INCOME	($53,196)		(15,582)		($68,778)
				IS Transaction Sum		

Cash Flow Statement

for the period including Transactions 1 through 24

		prior	+	transaction	=	sum
a	BEGINNING CASH BALANCE	$0				$0
b	CASH RECEIPTS	234,900		—		234,900
c	CASH DISBURSEMENTS	216,478		—		216,478
b - c = d	CASH FLOW FROM OPERATIONS	18,422				18,422
e	PP&E PURCHASE	1,750,000		—		1,750,000
f	NET BORROWINGS	1,000,000		—		1,000,000
g	INCOME TAXES PAID	0		—		0
h	SALE OF CAPITAL STOCK	1,550,000		—		1,550,000
a + d - e + f - g + h = i	ENDING CASH BALANCES	$818,422		0		$818,422
				CF Transaction Sum		

Balance Sheet

as of this Transaction 24

		prior	+	transaction	=	sum
A	CASH	$818,422		—		$818,422
B	ACCOUNTS RECEIVABLE	15,900	1B	(15,900)		0
C	INVENTORIES	414,770		—		414,770
D	PREPAID EXPENSES	0		—		0
A + B + C + D = E	CURRENT ASSETS	1,249,092				1,233,192
F	OTHER ASSETS	0		—		0
G	FIXED ASSETS @ COST	1,750,000		—		1,750,000
H	ACCUMULATED DEPRECIATION	14,286		—		14,286
G - H = I	NET FIXED ASSETS	1,735,714				1,735,714
E + F + I = J	TOTAL ASSETS	$2,984,806		(15,900)		$2,968,906
				Assets Sum		
K	ACCOUNTS PAYABLE	$469,204		—		$469,204
L	ACCRUED EXPENSES	18,798	2B	(318)		18,480
M	CURRENT PORTION OF DEBT	100,000		—		100,000
N	INCOME TAXES PAYABLE	0		—		0
K + L + M + N = O	CURRENT LIABILITIES	588,002				587,684
P	LONG-TERM DEBT	900,000		—		900,000
Q	CAPITAL STOCK	1,550,000		—		1,550,000
R	RETAINED EARNINGS	(53,196)	3	(15,582)		(68,778)
Q + R = S	SHAREHOLDERS' EQUITY	1,496,804				1,481,222
O + P + S = T	TOTAL LIABILITIES & EQUITY	$2,984,806		(15,900)		$2,968,906
				Liabilities & Equity Sum		

Learning Subjects

1. Principle of Accounting System Dynamics
2. Accounting System Dynamics Simplified
   - Household Account Booking -
3. Accounting System Dynamics in Action

Accounting in Crisis: Enron

Special-Purpose Entities(SPEs)

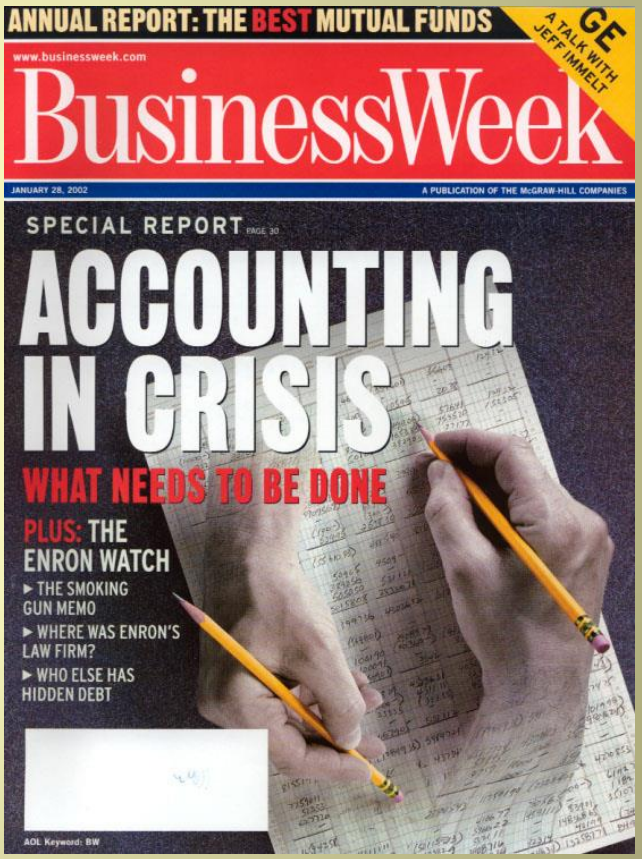
- ✓ Normally, once a company owns 50% or more of another, it must consolidate it under the 1959 rules.
- ✓ The controversial exception is that outsiders need invest only 3% of an SPE's capital for it to be independent and off the balance sheet.
- ✓ It 1990, accounting firms asked the SEC to endorse the 3% rule that had become a common, though unofficial practice in the '80s.

Accounting in Crisis: Enron

Special-Purpose Entities(SPEs)

- ✓ The SEC didn't like the idea, but it didn't stomp on it, either -- fumbles by the Securities & Exchange Commission and the Financial Accounting Standards Board.
- ✓ The SEC asked the FASB to set tighter rules to force consolidation of entities that were effectively controlled by companies.

FASB = Financial Accounting Standards Board



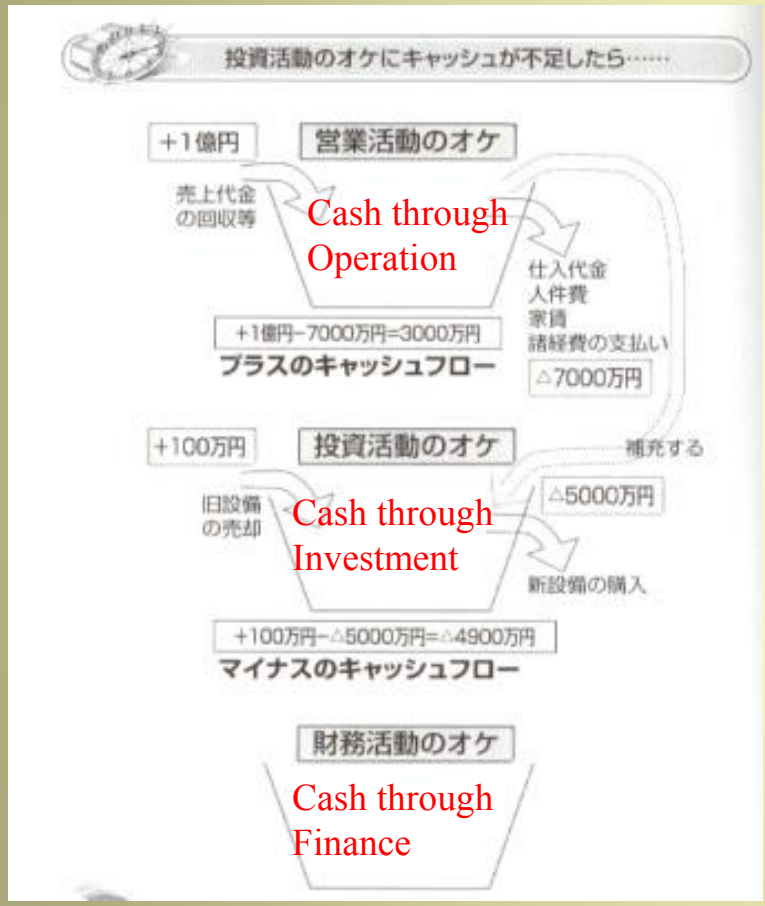
Business Week
January 28, 2002, p. 36

1. Accounting System Dynamics

This method was originally presented in the following paper:

Principle of Accounting System Dynamics
– Modeling Corporate Financial Statements,
by Kaoru Yamaguchi,
International System Dynamics Conference 2003,
Proceedings, New York, 2003.

System Dynamics Applied to Accounting



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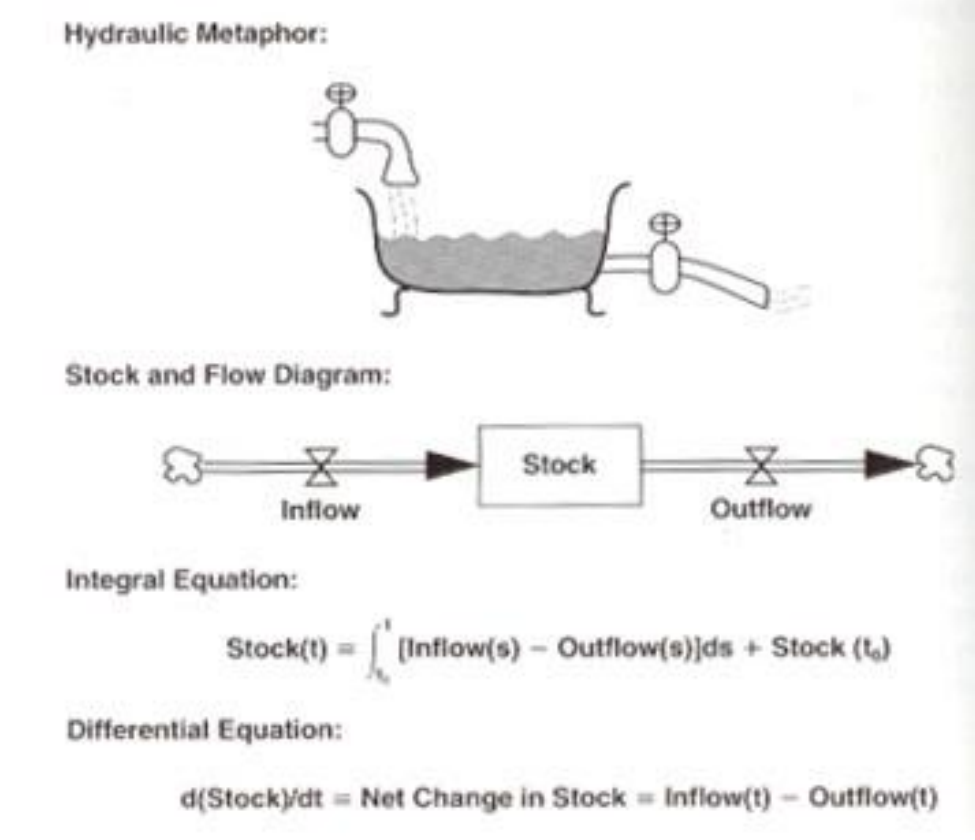
久保豊子著、ダイアモンド社
２０００年、p. 111

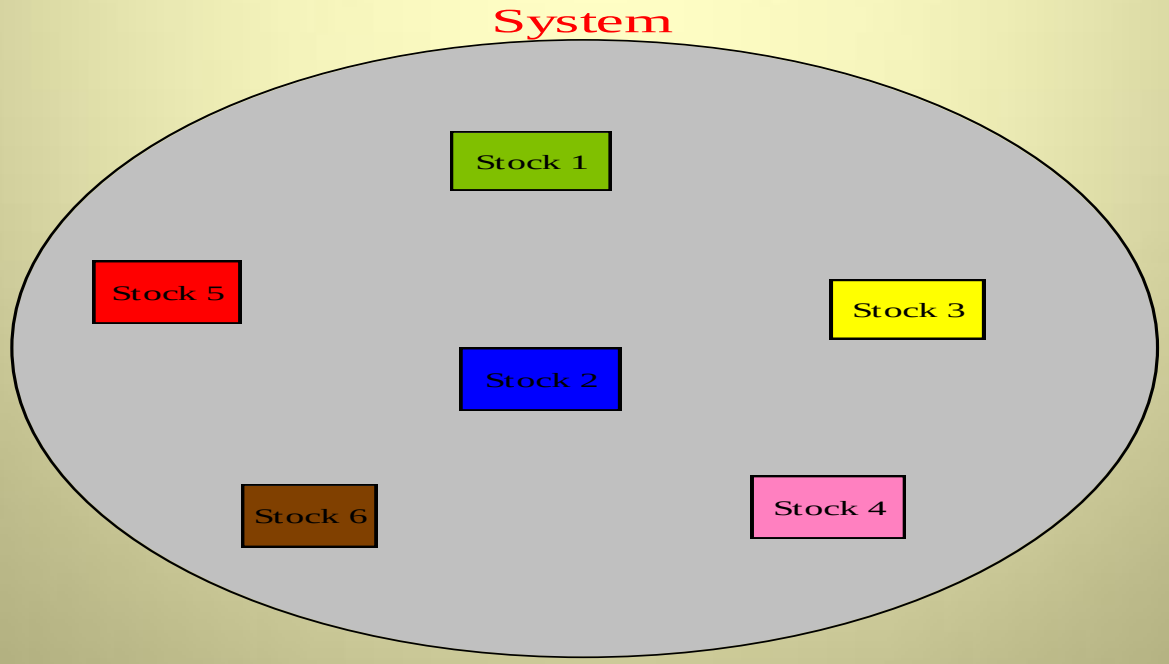


Business Dynamics by John D. Sterman,
McGraw-Hill Companies, 2000, p.194

Principles of System Dynamics(1)

Principle 1. System as a Collection of Stocks

System can be described by a collection of state variables, called *stocks* in system dynamics, whose levels or volumes are measured at a *moment in time*.

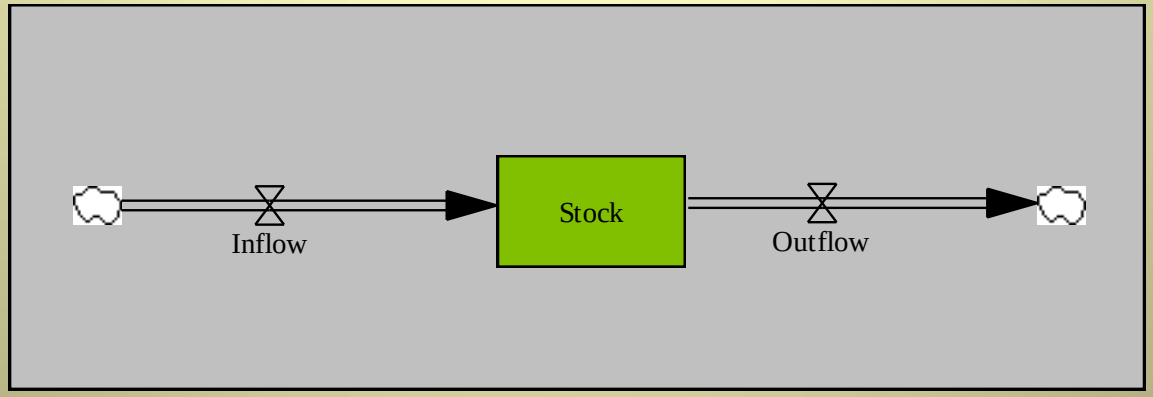


Principles of System Dynamics(2)

Principle 2. Stock-Flow Relation

Levels of a stock can only be changed by the amount of *flows* measured for a *period of time*.

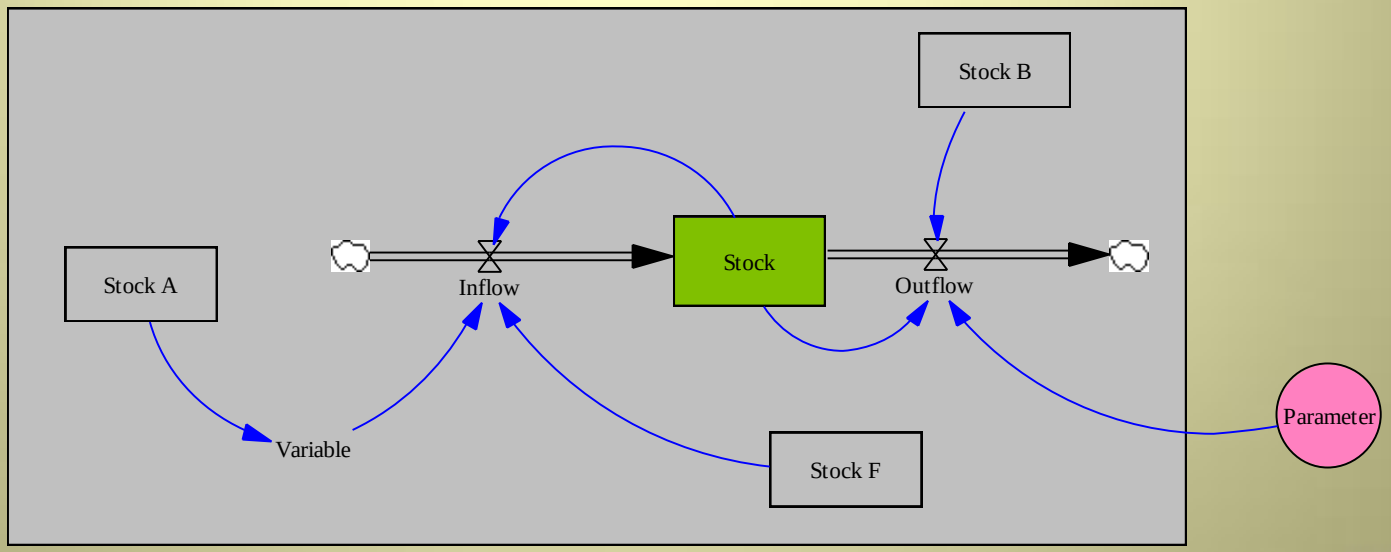
The amount of flow that increases the stock is called *inflow*, while the one that decreases it is called *outflow*.



Principles of System Dynamics(3)

Principle 3. Information Feedback

The amount of inflows and outflows is directly or indirectly determined either by the information obtained from the stocks through their feedback loops, or parameters obtained outside the system.



Principles of Accounting System(1)

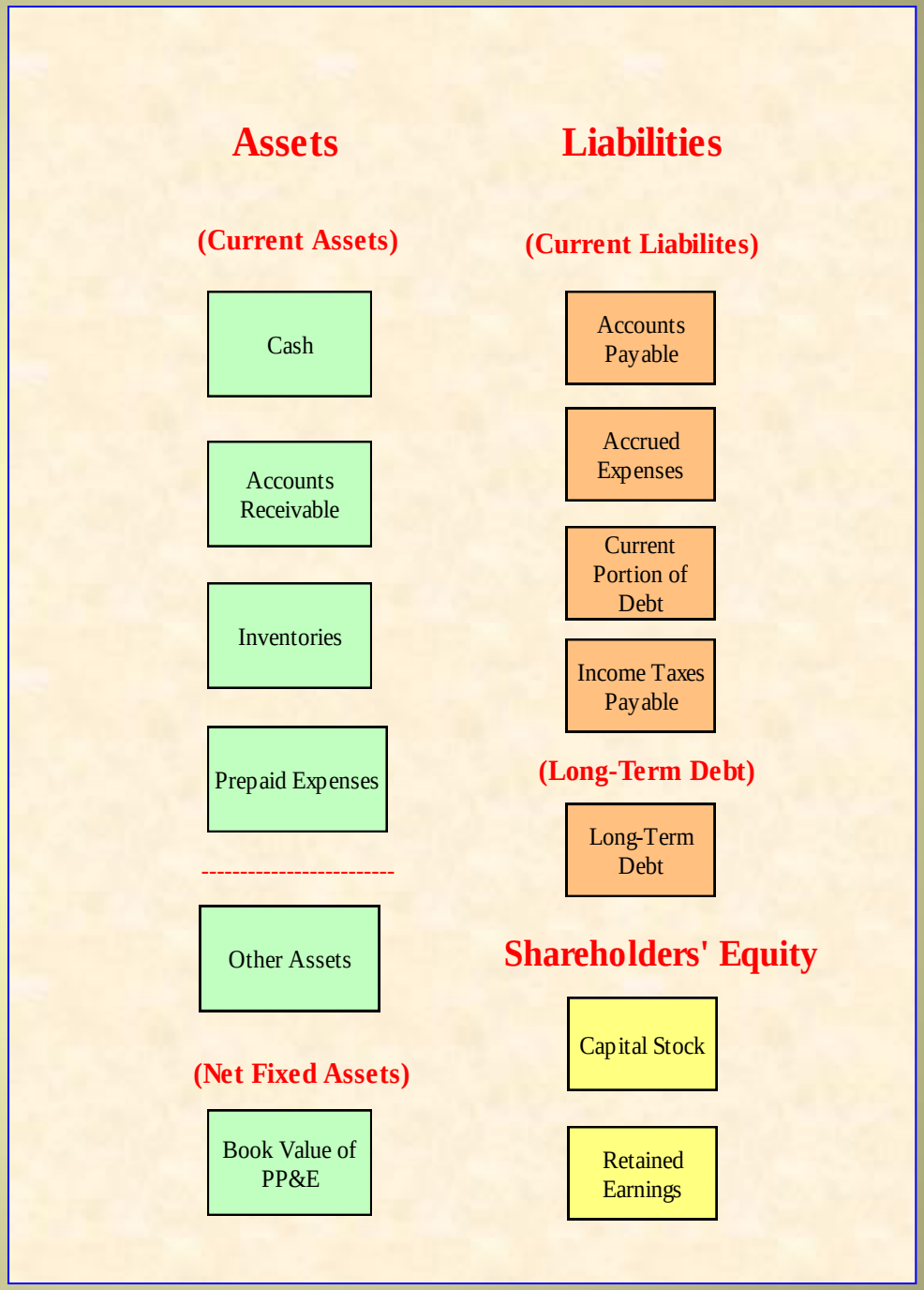
Principle 4. Stock-Flow Relation of Financial Statements

Balance sheet is a collection of stocks only, while income statement and cash flow statement consist of inflows and outflows of the stocks in balance sheet.

The balance sheet reports the aggregate effect of transactions at a point in time, whereas the income statement, statement of retained earnings, and statement of cash flows report the effect of transactions over a period of time.

Patrick R. Delaney, Barry J. Epstein, Ralph Nach, Susan Weiss Budak. WILEY GAAP 2003, John Wiley & Sons, Inc., New York, 2002.

Balance Sheet as a System of Stocks



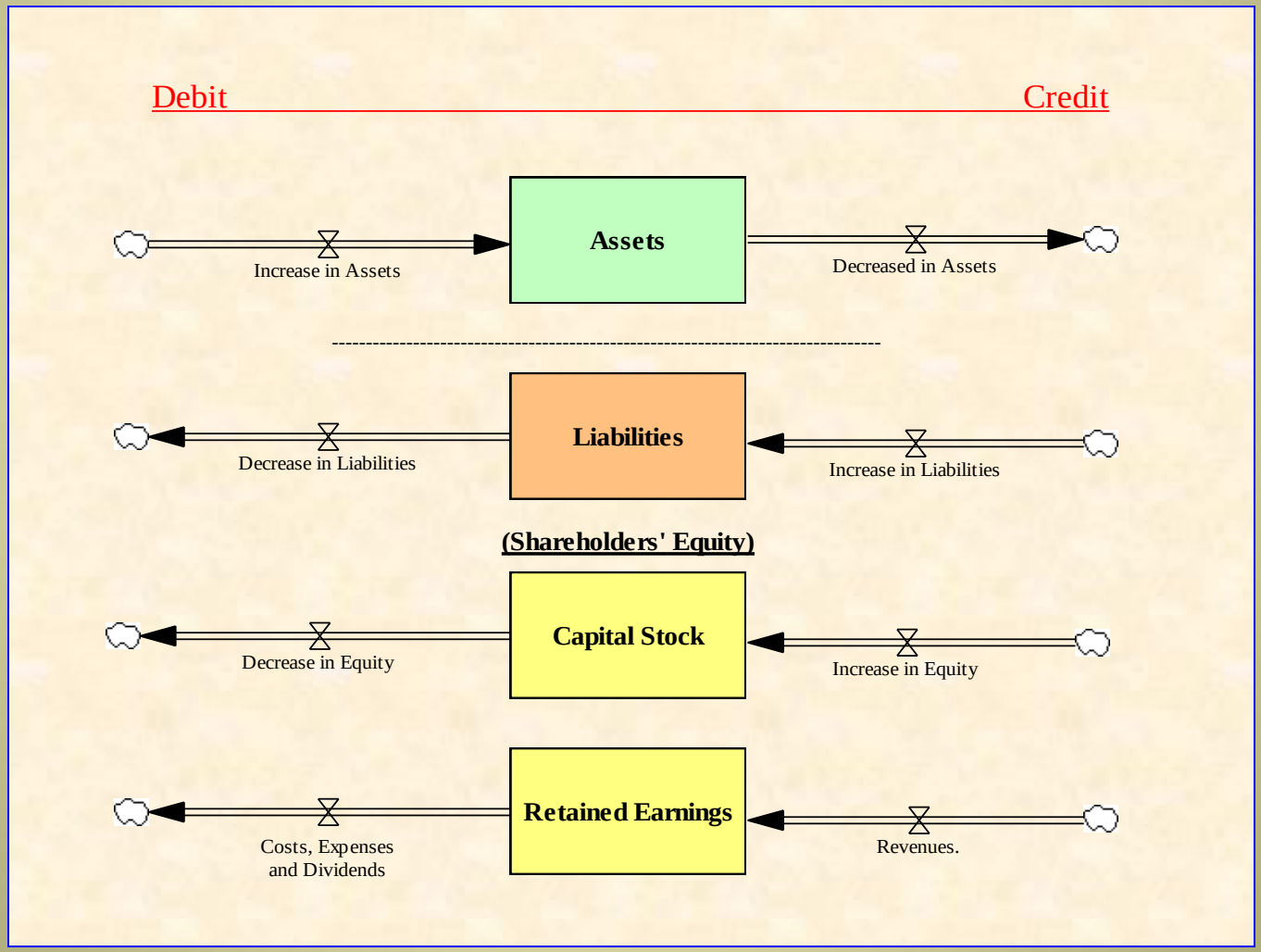
Principles of Accounting System(2)

Principle 5. Double Entry Rule of Bookkeeping

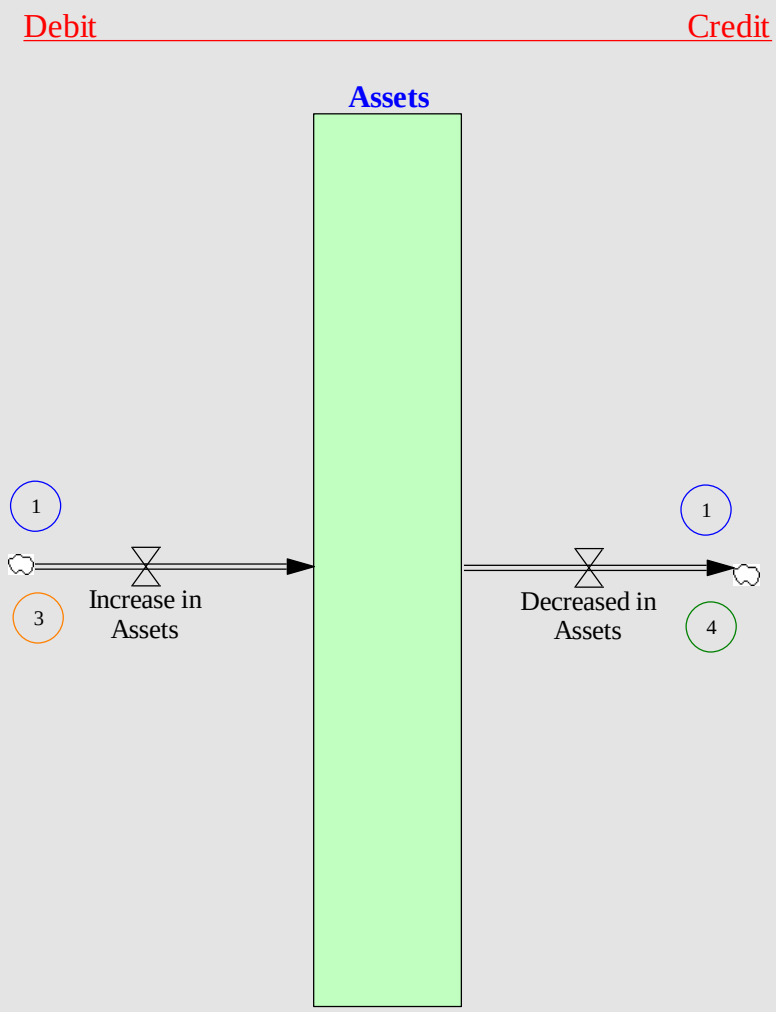
All transactions in the accounting system are recorded as inflows and/or outflows of stocks in the balance sheet so that each transaction causes two corresponding stocks to change simultaneously in balance.

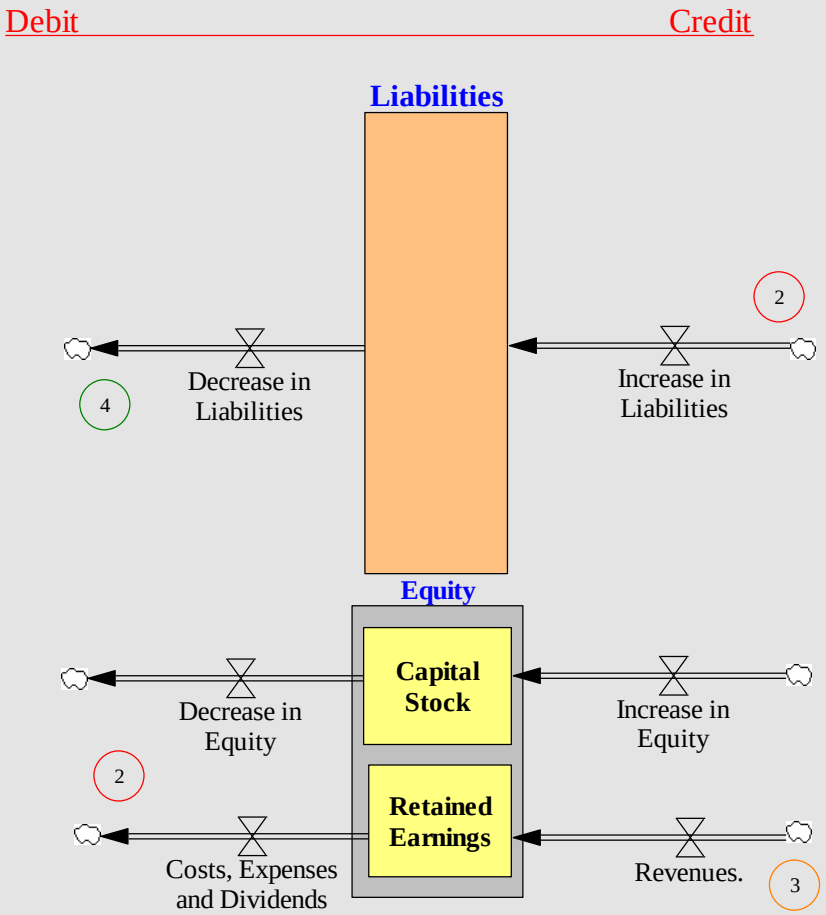
For this purpose, each transaction is booked twice on both debit and credit sides. Inflows of assets and outflows of liabilities and shareholders' equity are booked on the debit side, while outflows of assets and inflows of liabilities and shareholders' equity are booked on the credit side.

Double Entry Rule of Bookkeeping as Debit and Credit



Double Entry Rule of Bookkeeping as Debit and Credit

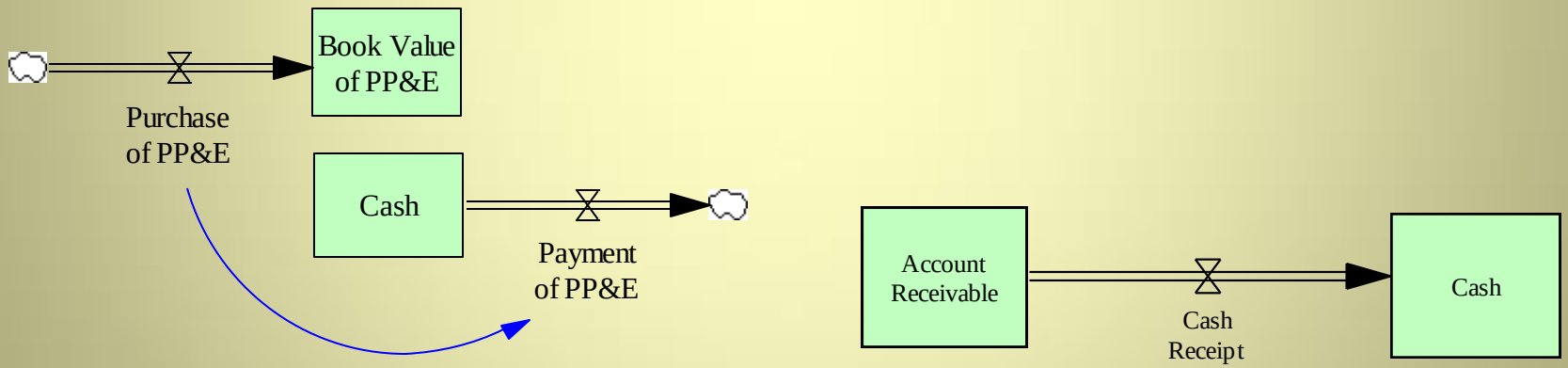




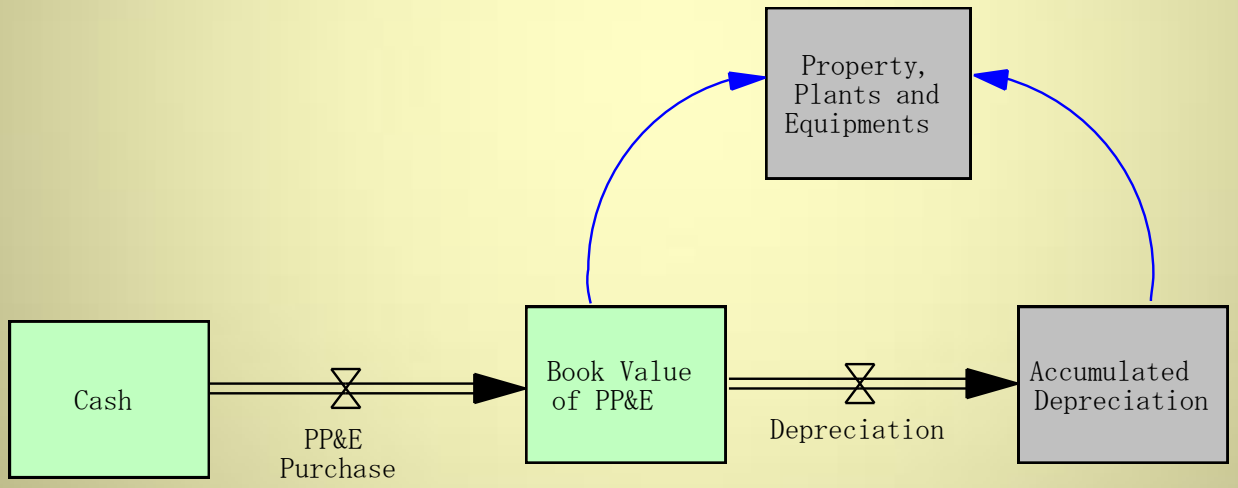
Double Entry Rule of Bookkeeping as Debit and Credit(1)

Debit:inflow <-> Credit:outflow

Transactions within assets are classified in this category.For example, an increase in Fixed Assets by the purchase of PP&E is balanced by the decrease in Cash by its payment.



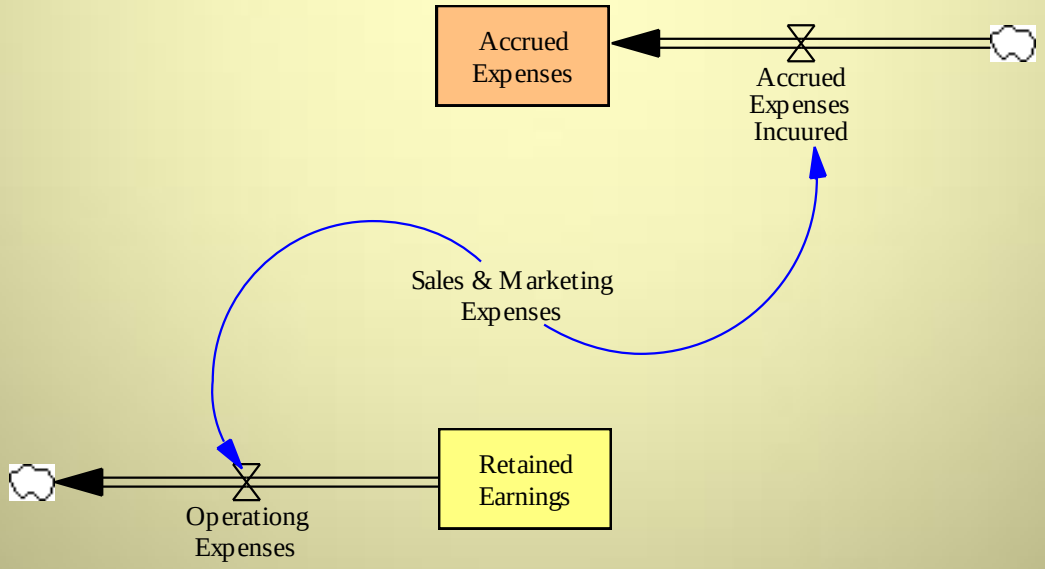
Double Entry Rule of Bookkeeping for Book Value



Double Entry Rule of Bookkeeping as Debit and Credit(2)

Debit:outflow <-> Credit:inflow

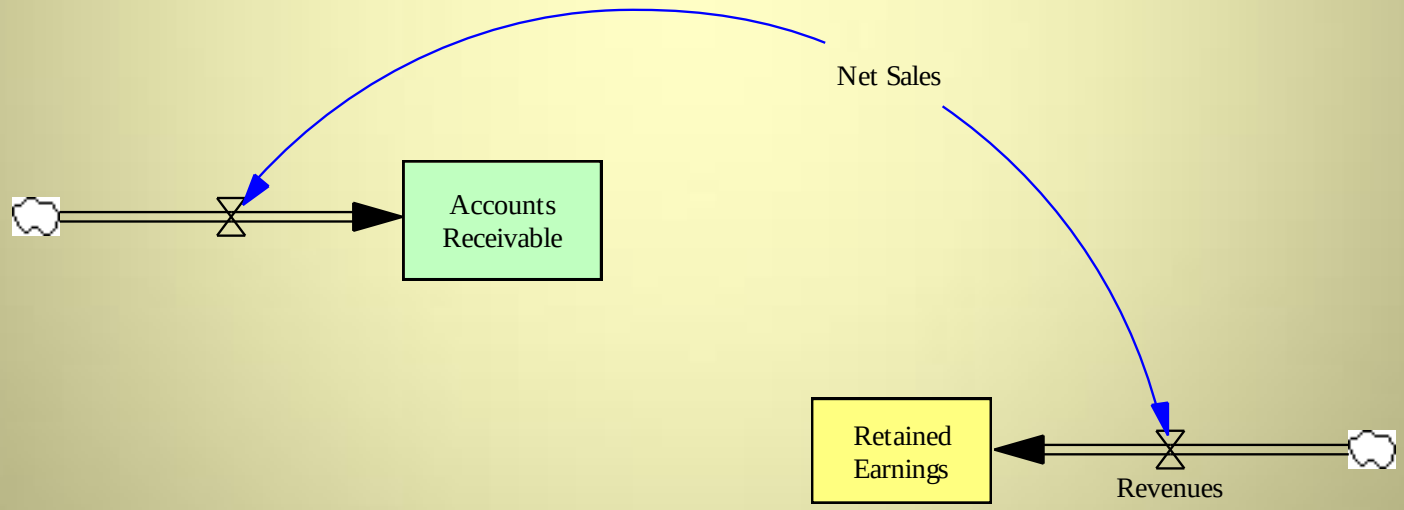
Transactions within liabilities and equity are classified here.For example, a decrease in Retained Earnings caused by an increase in operating expenses such as sales & marketing expenses is balanced by the increase in Accrued Expenses.



Double Entry Rule of Bookkeeping as Debit and Credit(3)

Debit:inflow <-> Credit:inflow

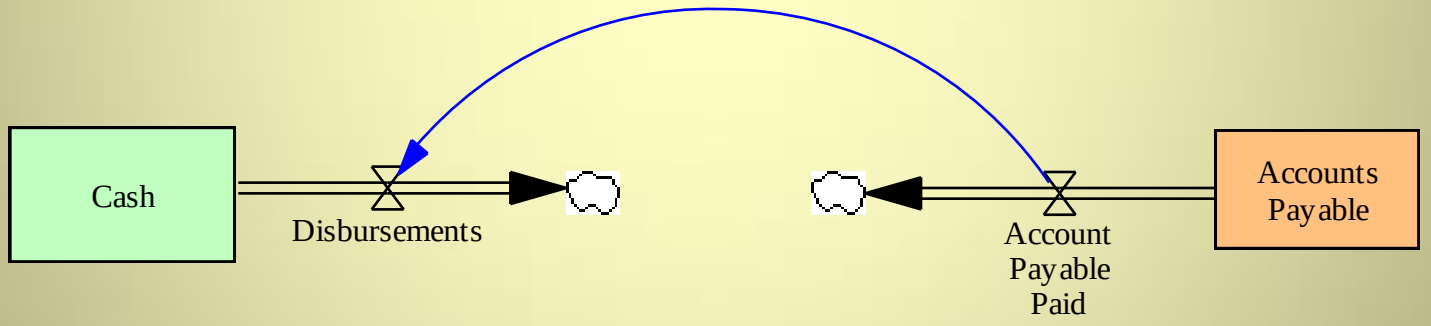
Transactions in this category cause both Assets and Liabilities/Equity to increase. For instance, an increase in net sales causes both Accounts Receivable and Retained Earnings to increase.



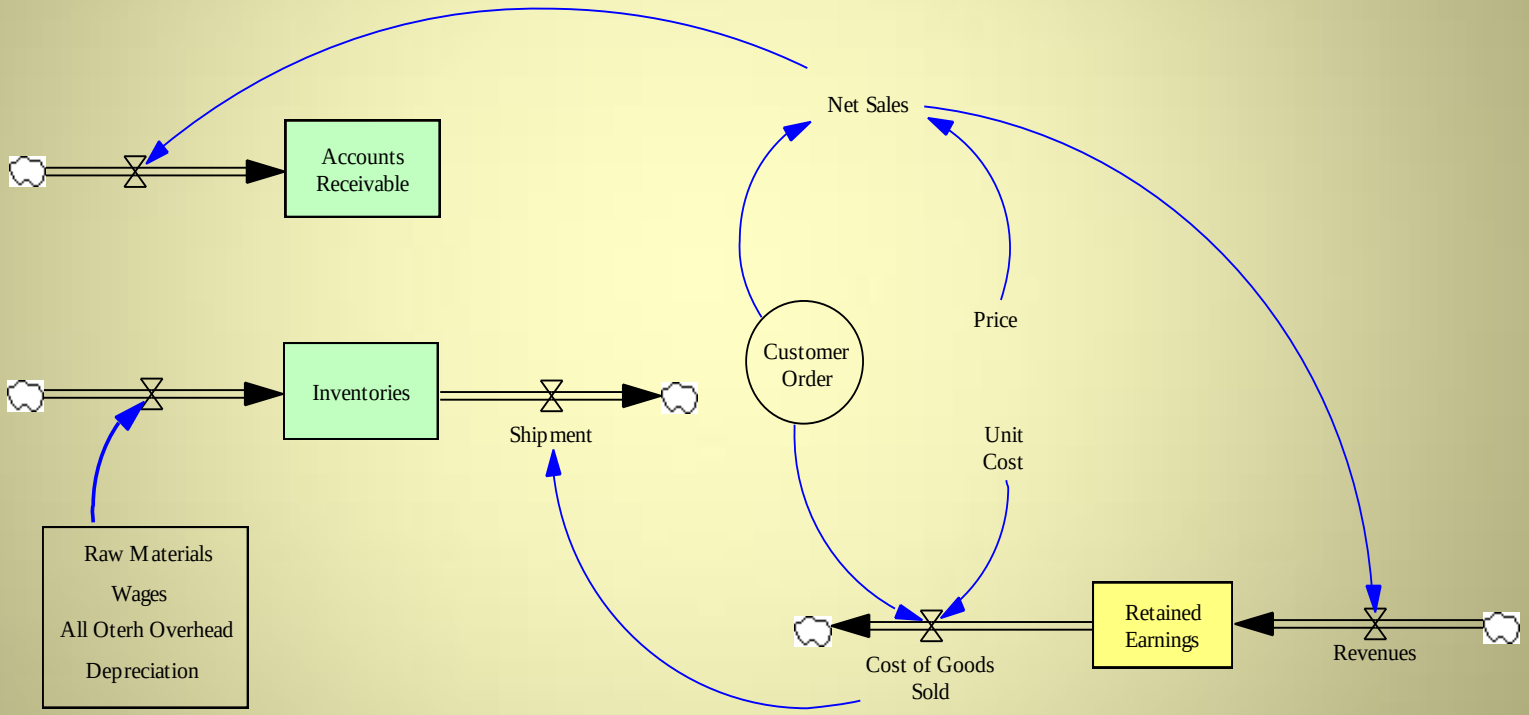
Double Entry Rule of Bookkeeping as Debit and Credit(4)

Debit:outflow <-> Credit:outflow

Transactions here cause both Assets and Liabilities/Equity to decrease. For instance, payment of Accounts Payable causes both Cash and Accounts Payable to decrease.



Double Entry Rule in Financial Statements
(3) & (4) Combined



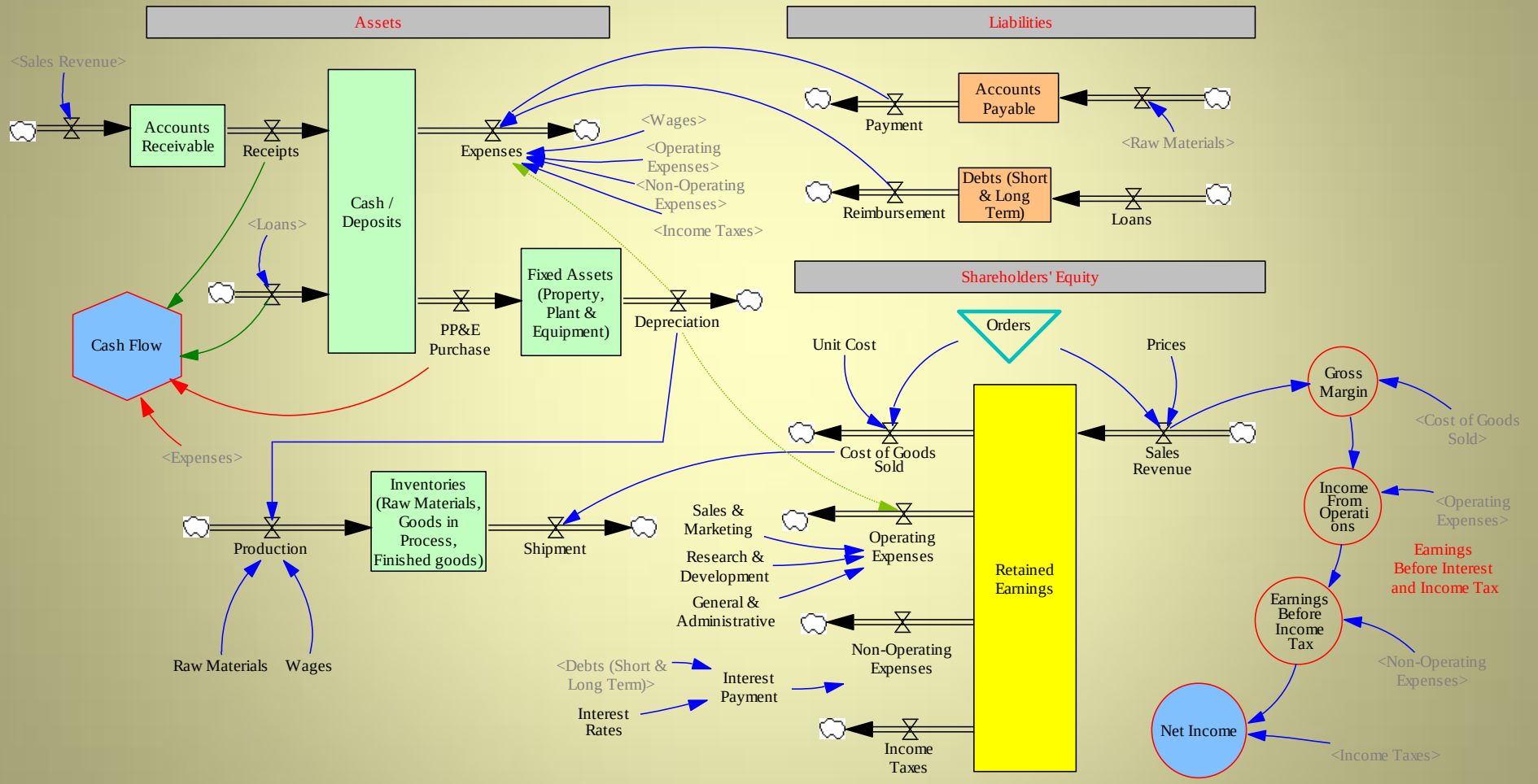
Principles of
Accounting System Dynamics

Principles 1 through 5 obtained from system

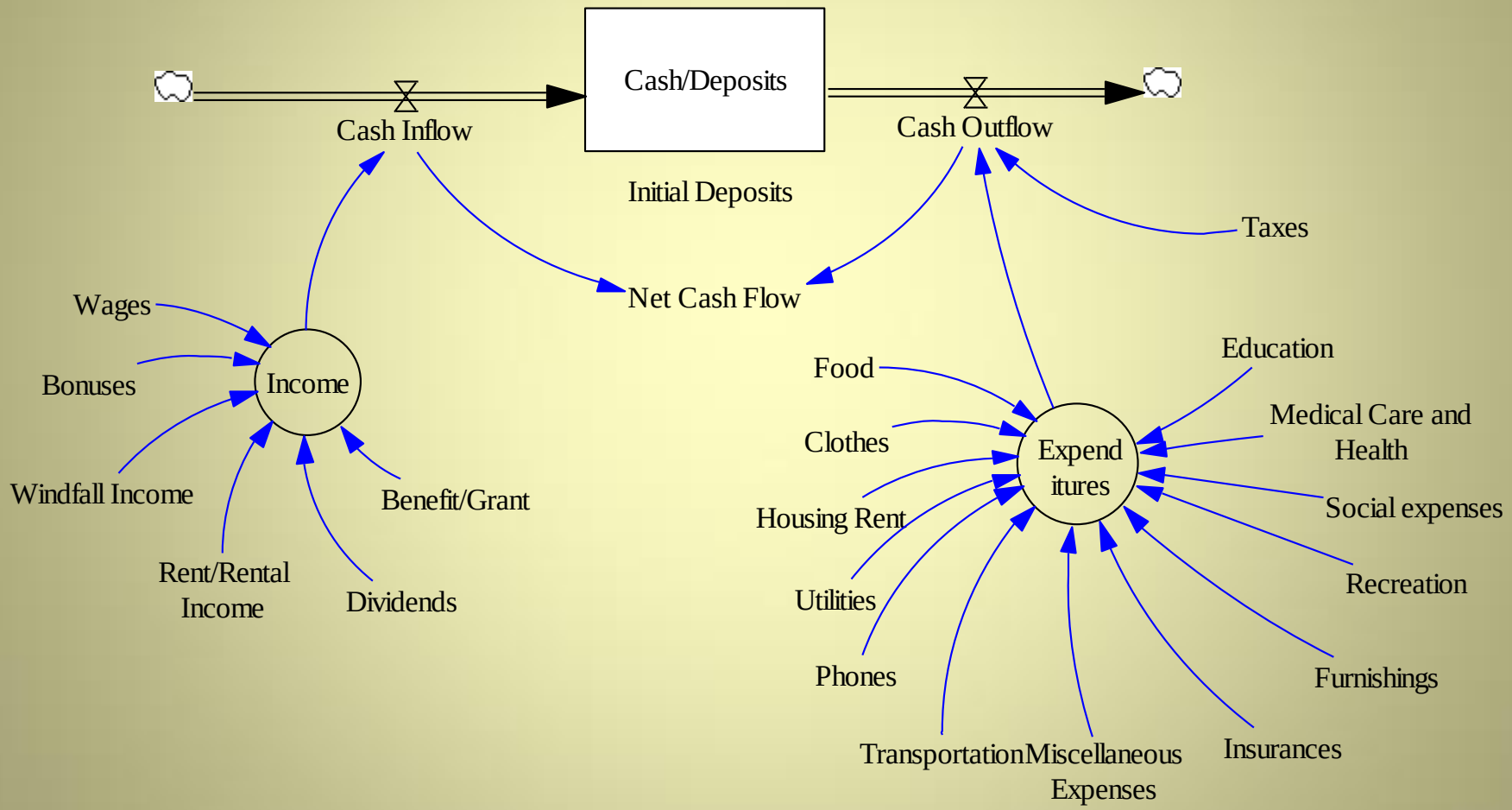
dynamics and accounting system constitutes

the Principle of Accounting System Dynamics.

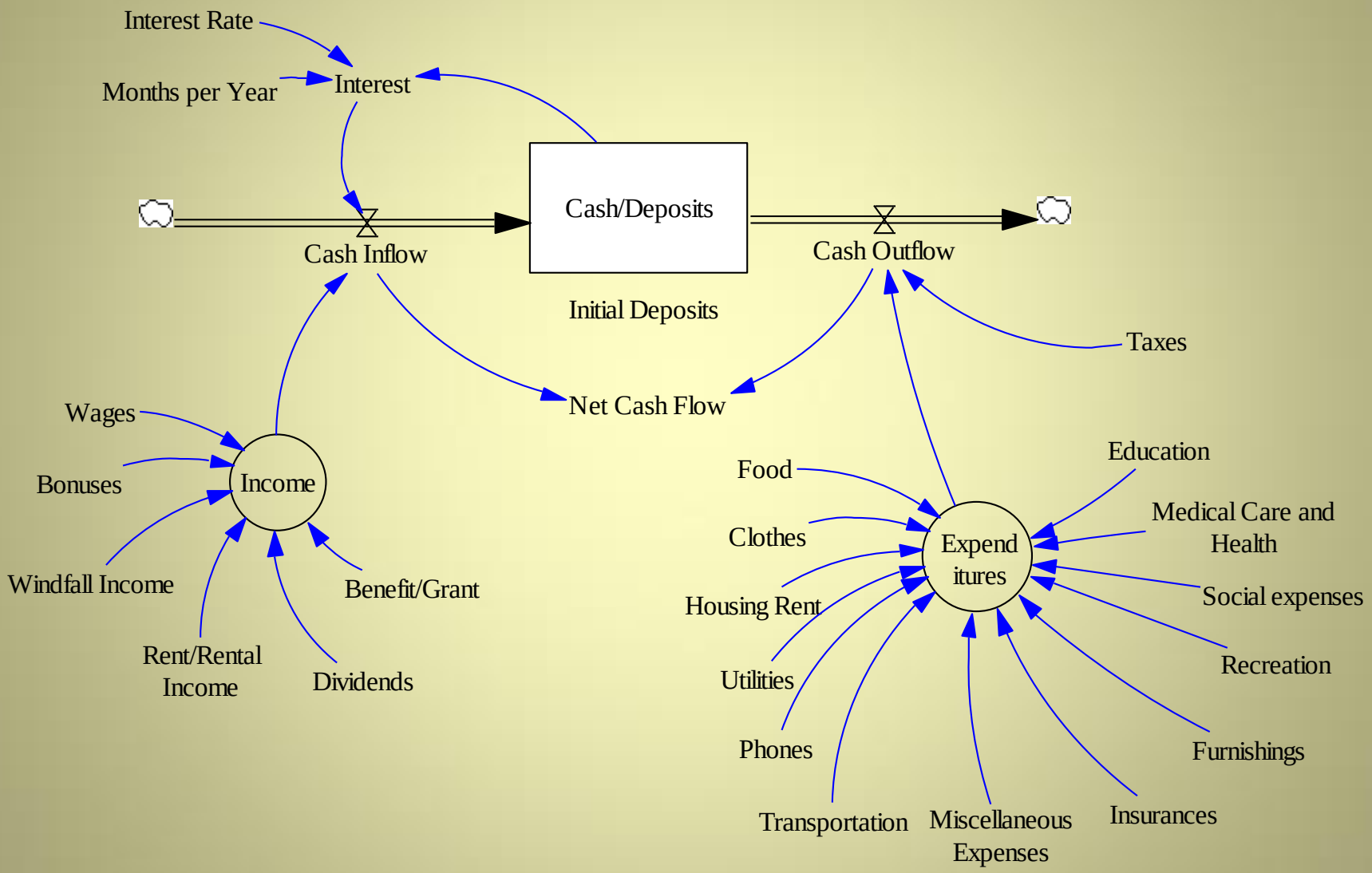
2. Accounting System Dynamics Simplified



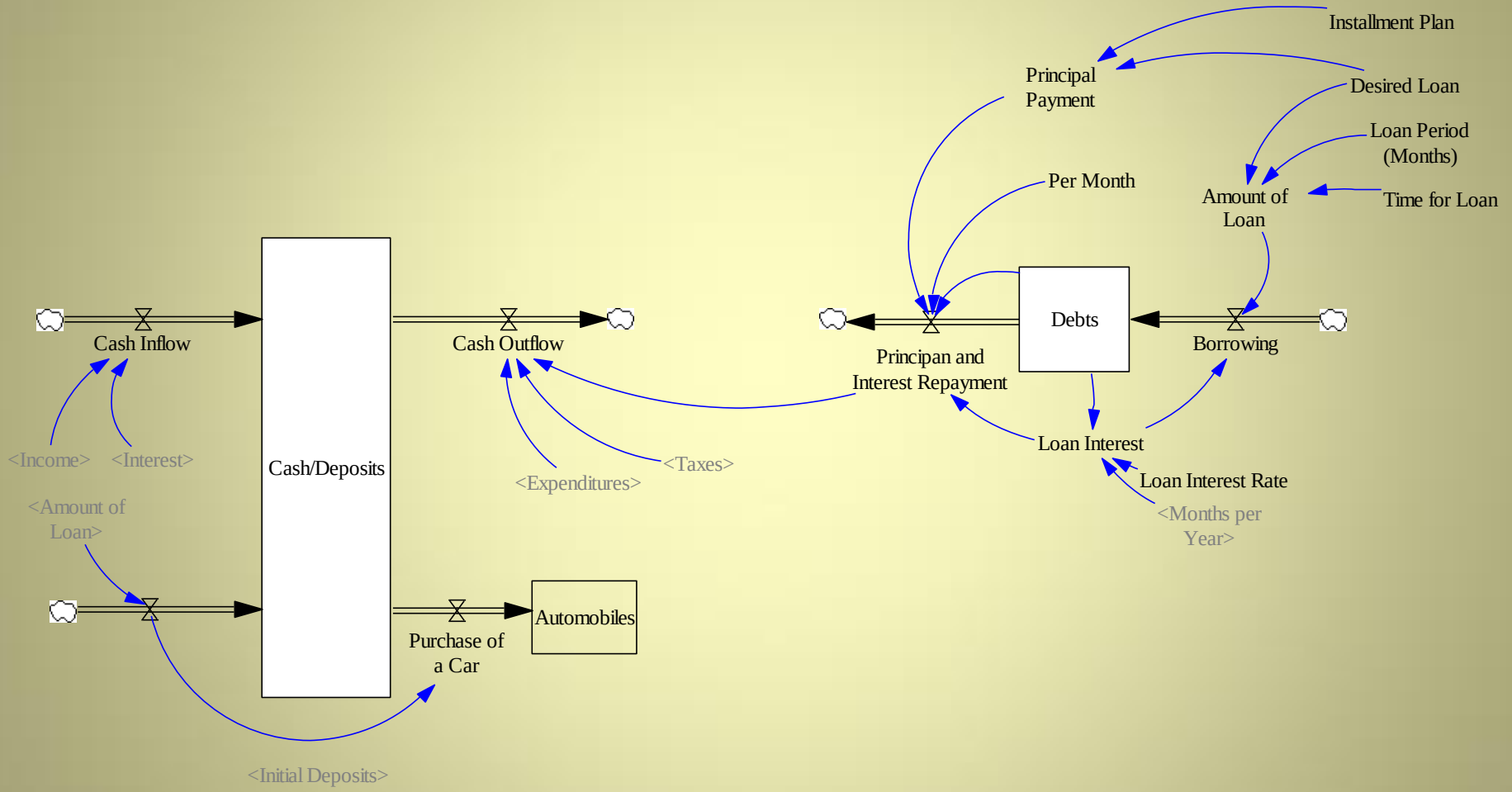
2.1 Cash Flow of Household Account



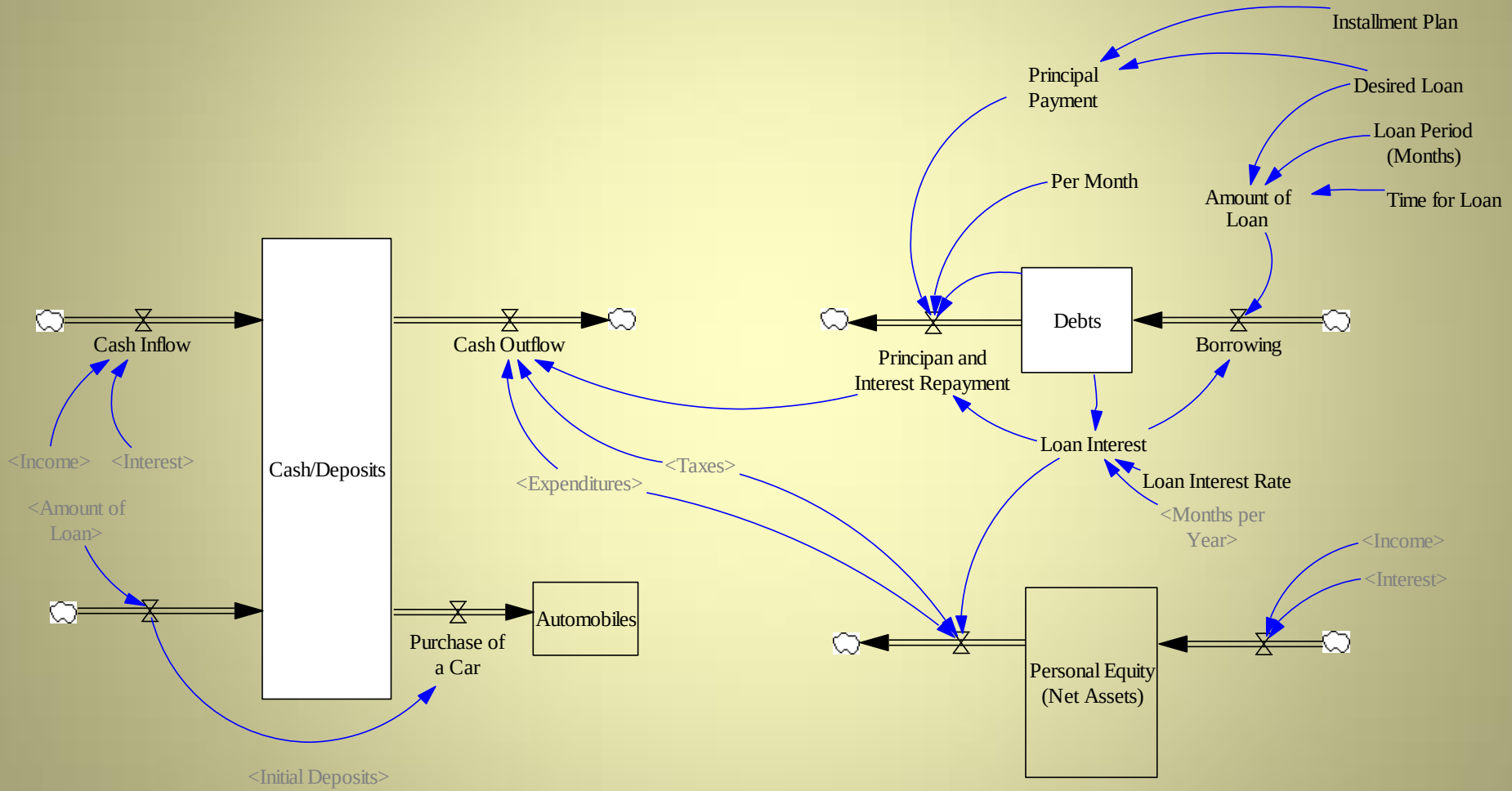
2.2 Financial (Interest) System



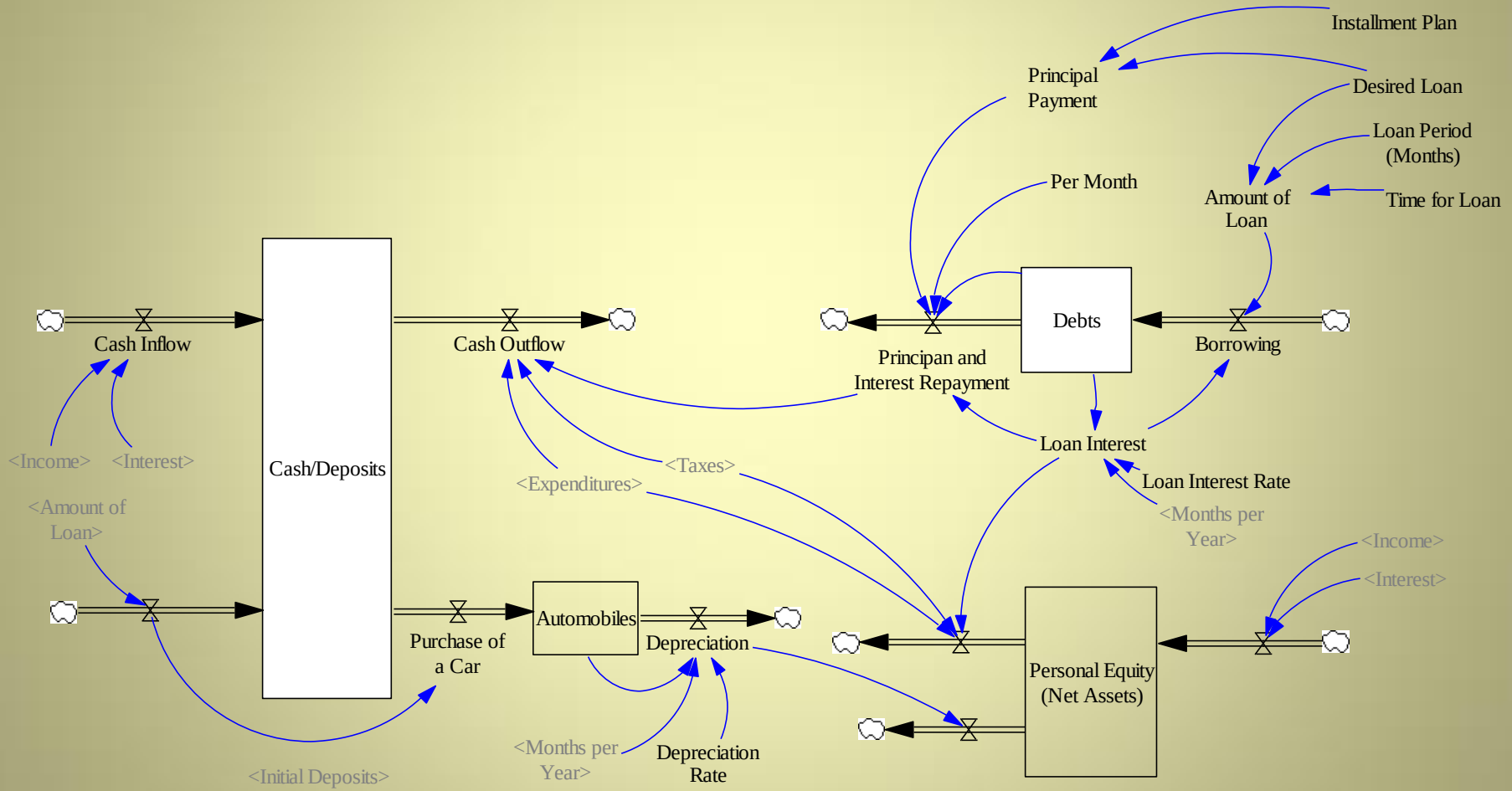
2. 3 Loans


Installment Plan
Principal Payment
Desired Loan
Loan Period (Months)
Per Month
Amount of Loan
Time for Loan
Cash Inflow
Cash Outflow
Debts
Principan and Interest Repayment
Borrowing
<Income>
<Interest>
Cash/Deposits
<Expenditures>
<Taxes>
Loan Interest
Loan Interest Rate
<Amount of Loan>
<Months per Year>
Automobiles
Purchase of a Car
<Initial Deposits>

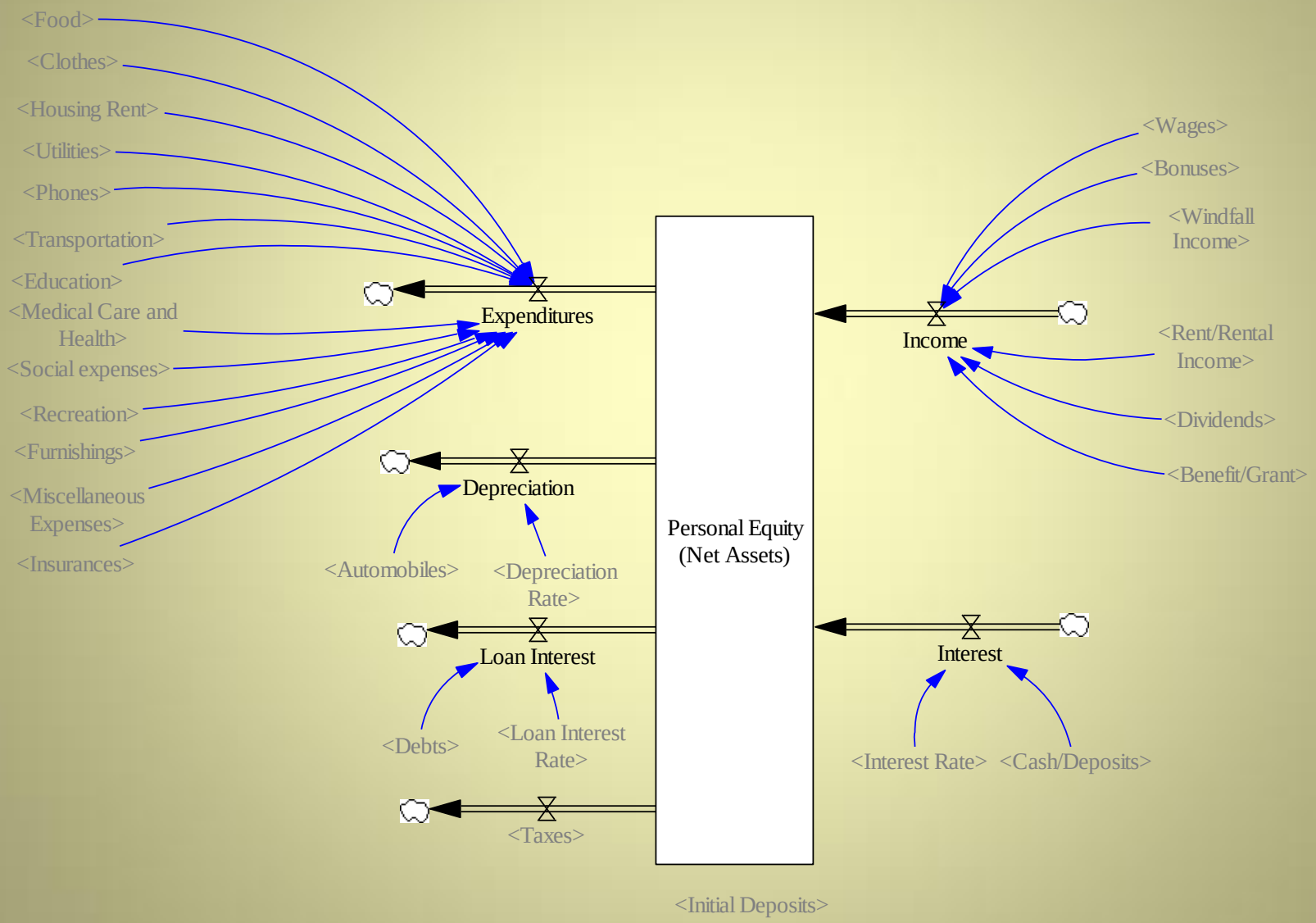
2.4 Personal Financial Management: Equity



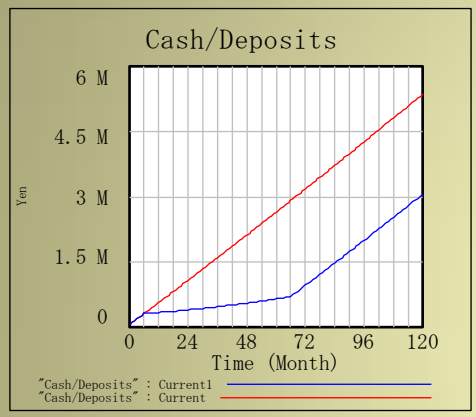
2.5 Personal Financial Management: Depreciation

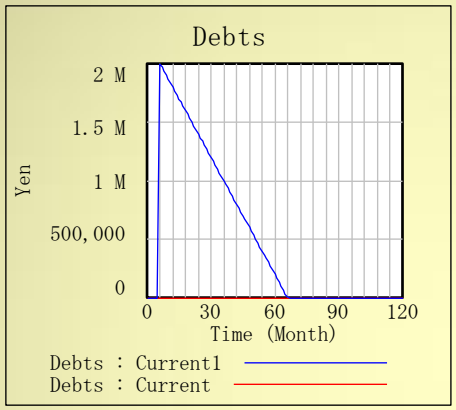


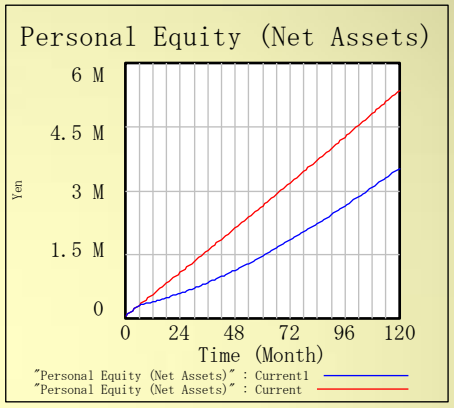
2.6 Income Statement

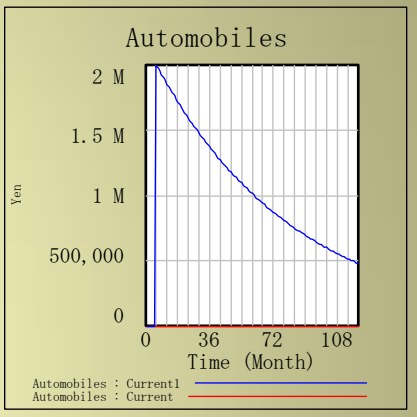


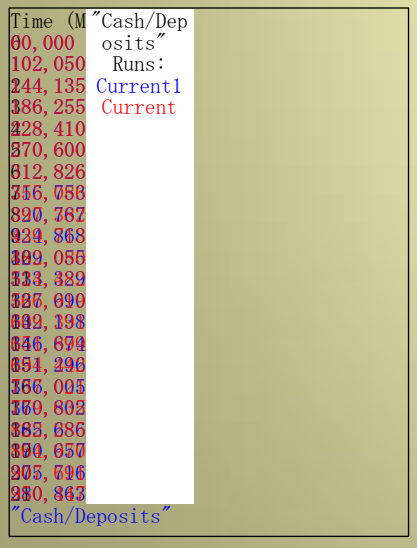
2.7 Simulation of Household Account

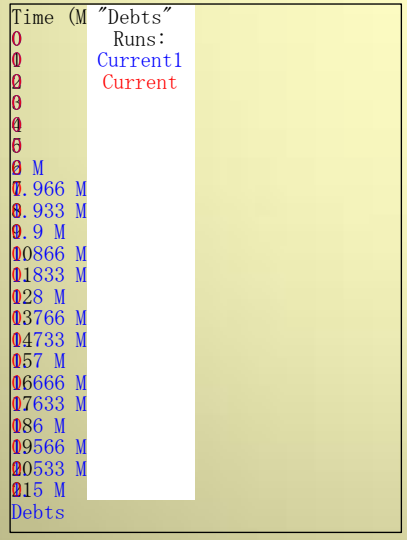


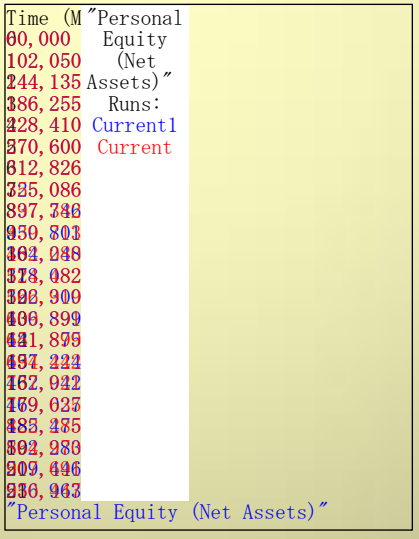


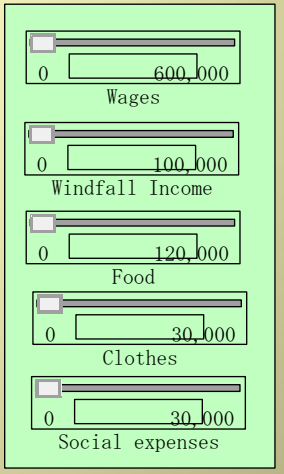


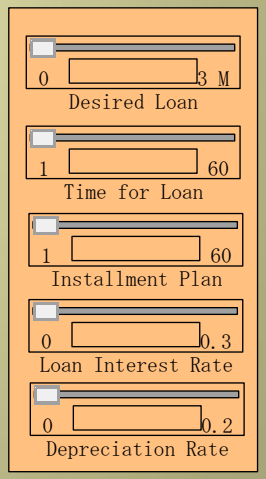




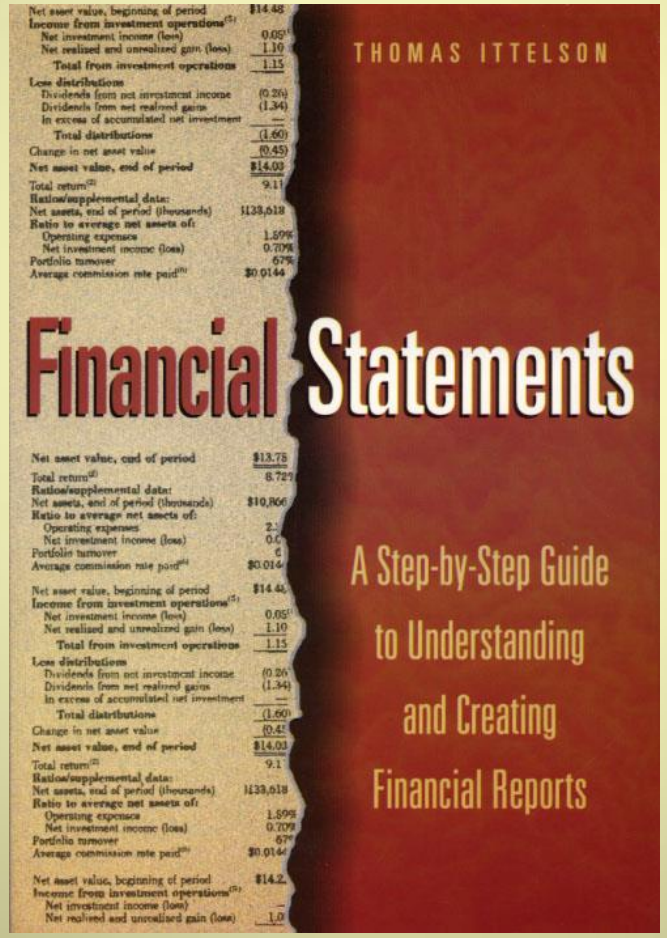








3 . Accounting System Dynamics in Action



Transactions (Startup)

You have just incorporated (in Delaware) and invested $50,000 of your own money into the company: AppleSeed. When you formed the company you bought 50,000 shares of "founder's stock" at $1 per share for a total investment of $50,000 in cash.

Transactions

① A group of investors is willing to exchange their $1.5 million in cash for stock certificates representing 150,000 common shares of AppleSeed Enterprises, Inc. Thus, after this sale to the investor group there will be 200,000 shares outstanding. They will own 75% of AppleSeed and you will own the rest.

② Book all payroll-associated company expenses totaling $6,230 including salary, employer's contribution to FICA (Social Security) and various insurance expenses. Issue yourself a payroll check for $3,370 (your $5,000 monthly salary minus $1,250 in federal and state withholding tax and $380 for your own contribution to FICA).

（FICA = Federal Insurance Contribution Act of 1937）

Transactions

③ Borrow $1 million to purchase an all-purpose building. This term note will run for 10 years, calling for yearly principal payments of $100,000 plus interest at a rate of 10% per annum.

④ Purchase 100,000 square foot building and land for $1.5 million in cash. This facility will serve as AppleSeed Enterprises' headquarters, manufacturing facility and warehouse.

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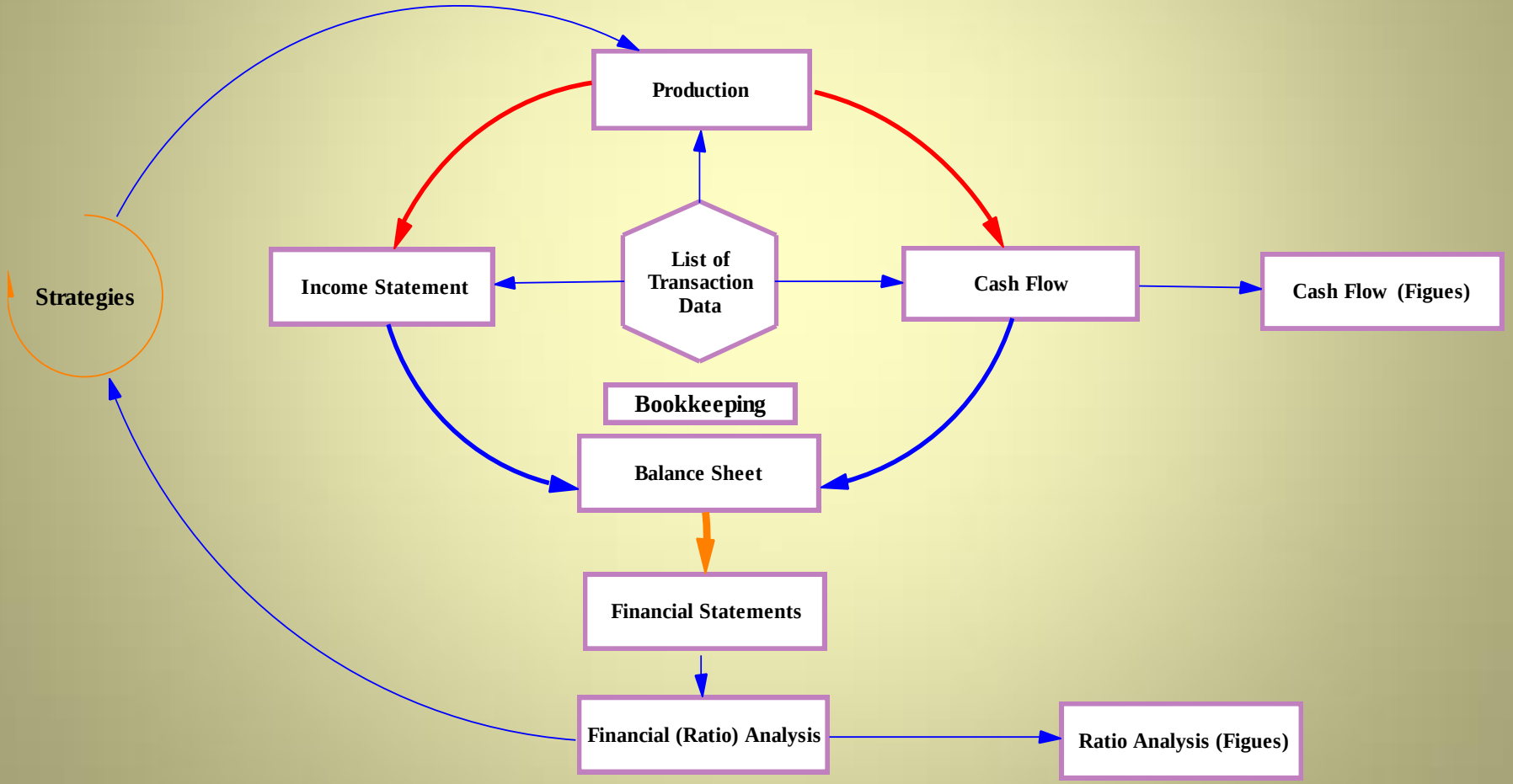
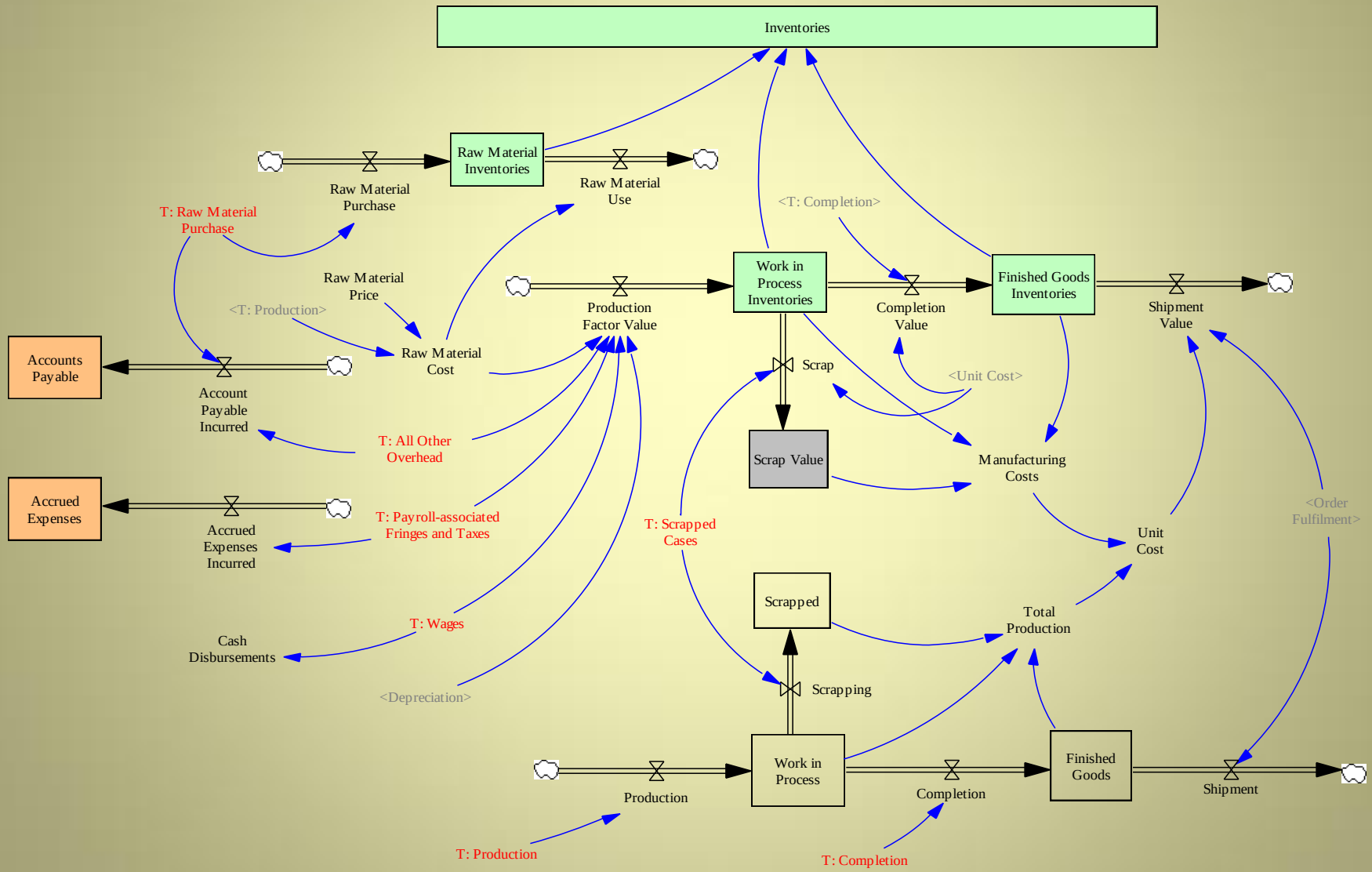
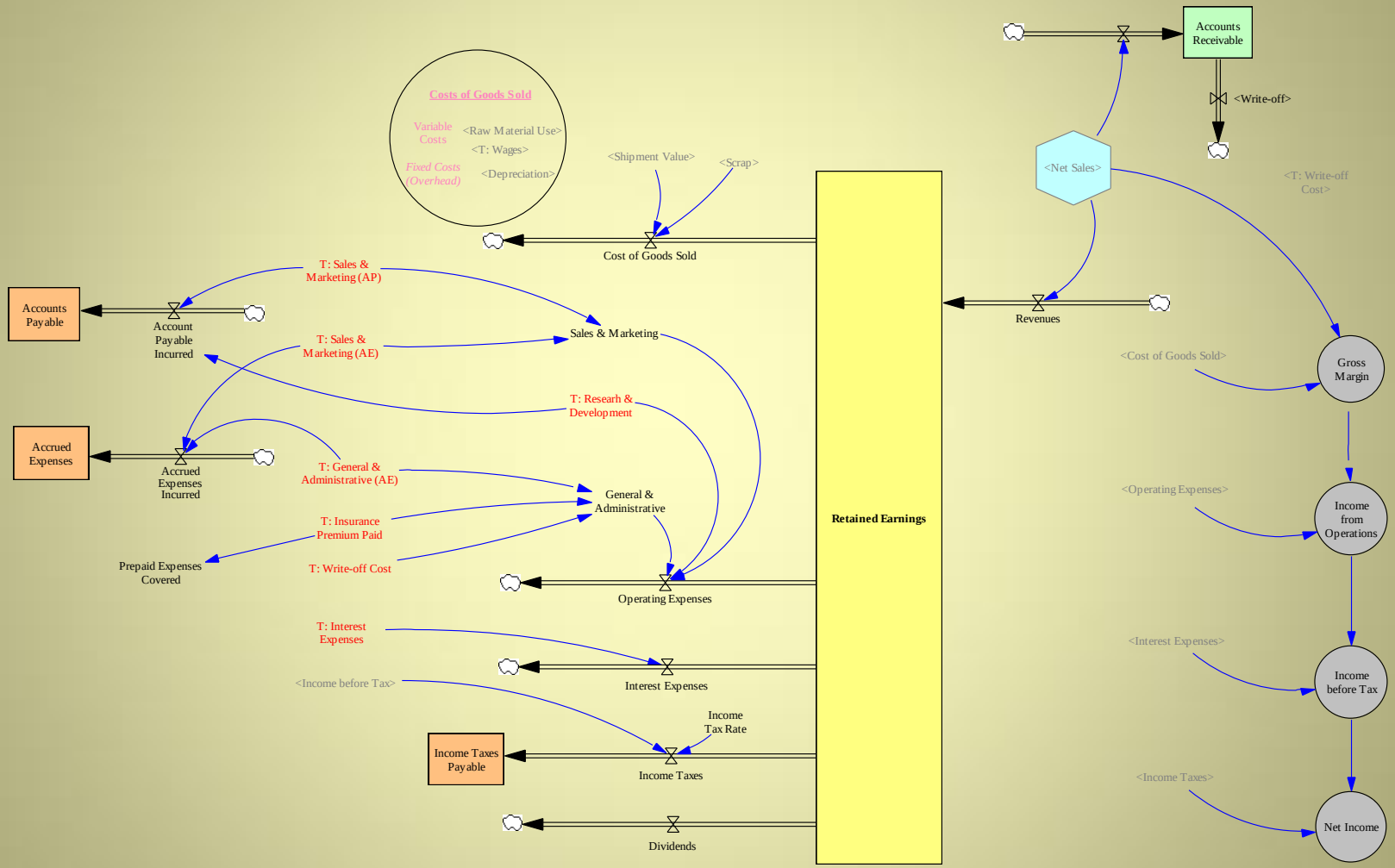
Corporate Financial Statements: Overview



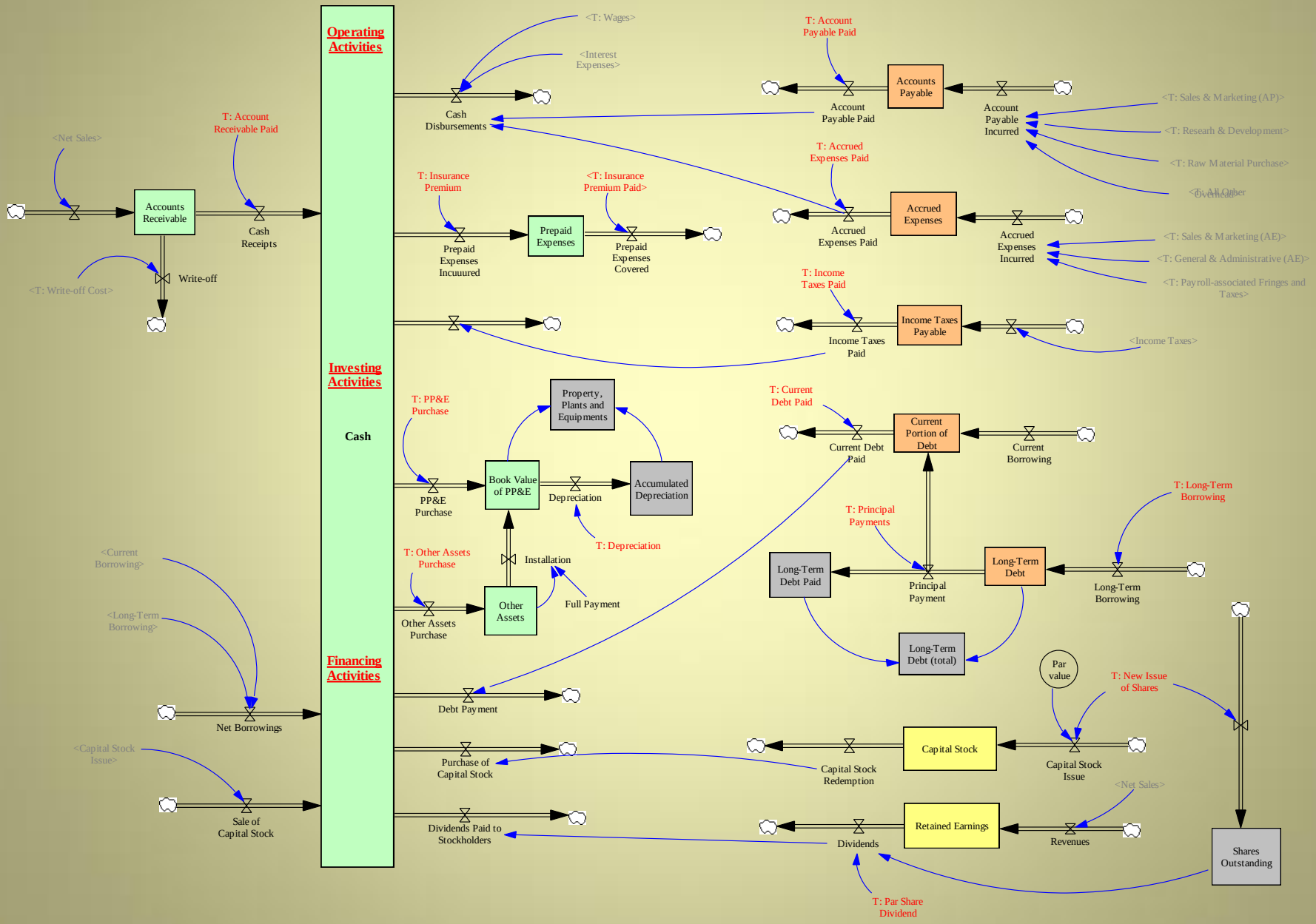
Production (Inventories)



Income Statement



Cash Flow Statement



List of Transaction Data

Cash (Receipts)

T: Account Receivable Paid

T: Long-Term Borrowing

T: Principal Payments

T: New Issue of Shares

T: Par Share Dividend

Cash (Disbursements)

T: Wages

T: PP&E Purchase

T: Other Assets Purchase

T: Account Payable Paid

T: Accrued Expenses Paid

T: Current Debt Paid

T: Income Taxes Paid

T: Insurance Premium

T: Interest Expenses

Account Receivable

T: Customer Order

Data: Price Change

T: Write-off Cost

Inventories

T: Production

T: Completion

T: Depreciation

T: Scrapped Cases

Prepaid Expenses

T: Insurance Premium Paid

Account Payable

T: Raw Material Purchase

T: All Other Overhead

T: Sales & Marketing (AP)

T: Researh & Development

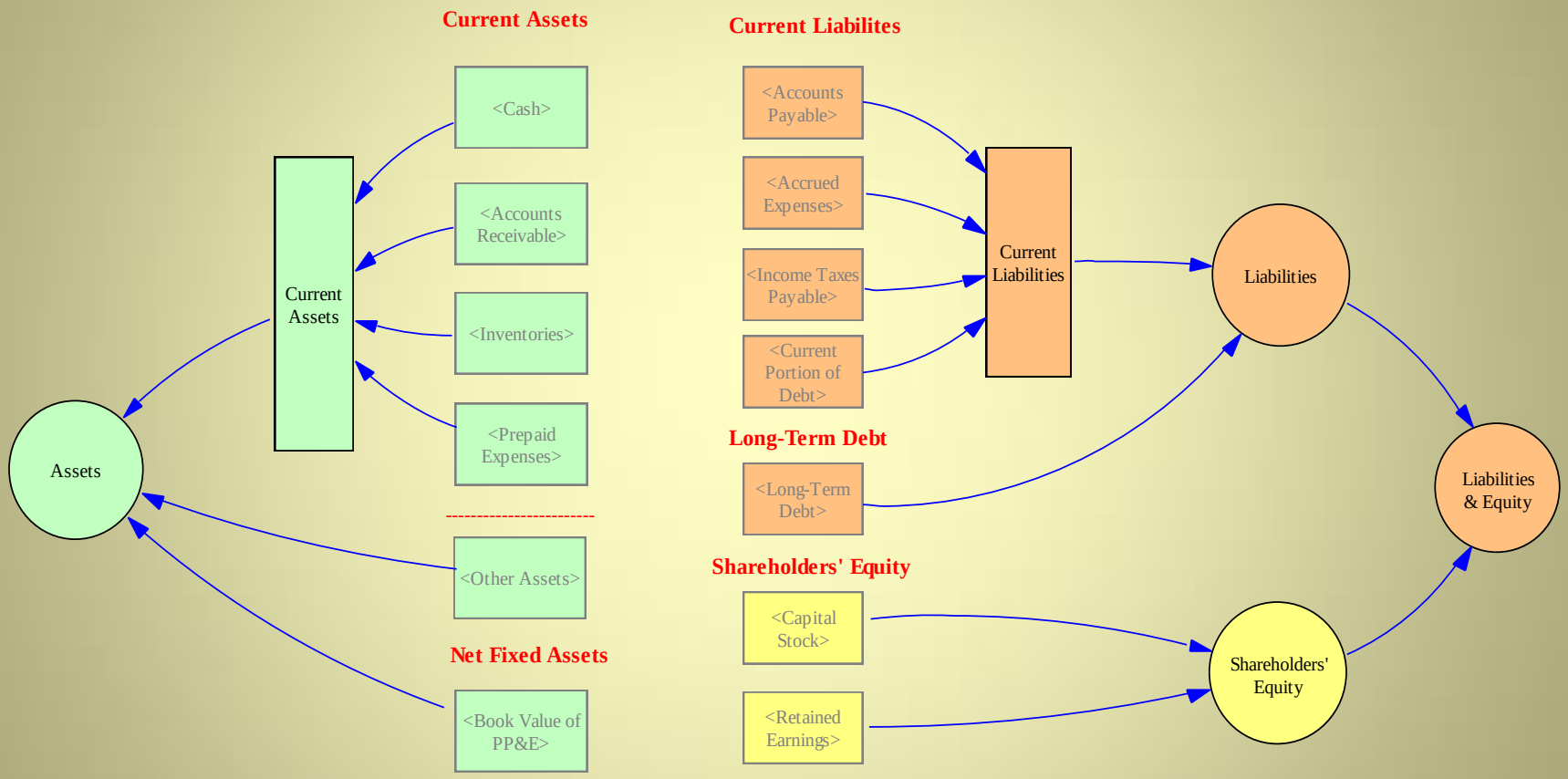
Accrued Expenses

T: Payroll-associated Fringes and Taxes

T: Sales & Marketing (AE)

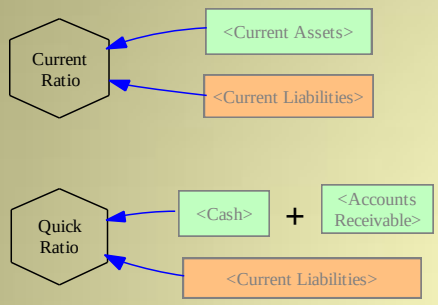
T: General & Administrative (AE)

Balance Sheet

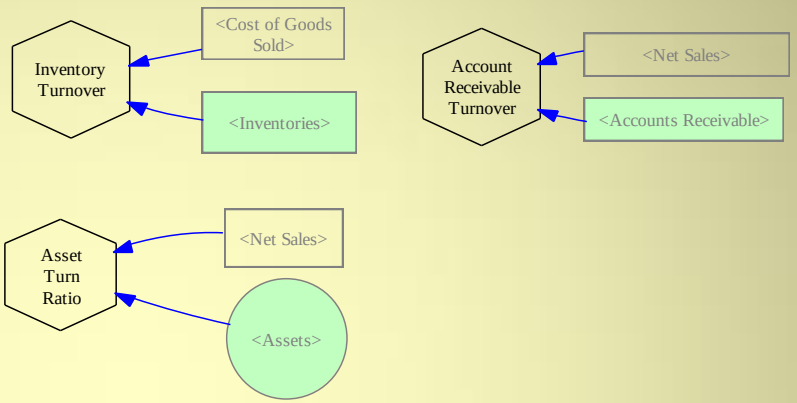


Ratio Analysis

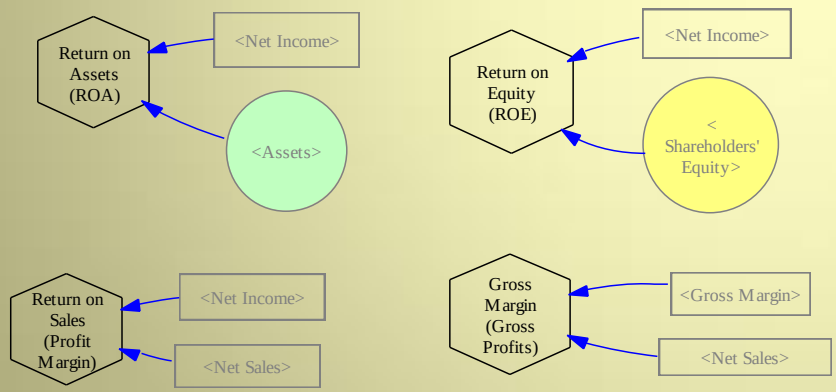
Liquidity Ratios



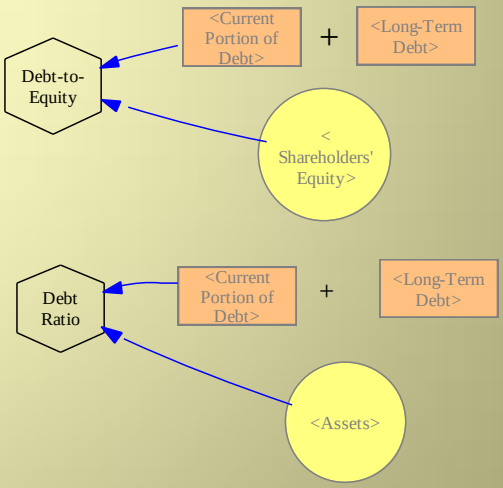
Asset Management Ratios



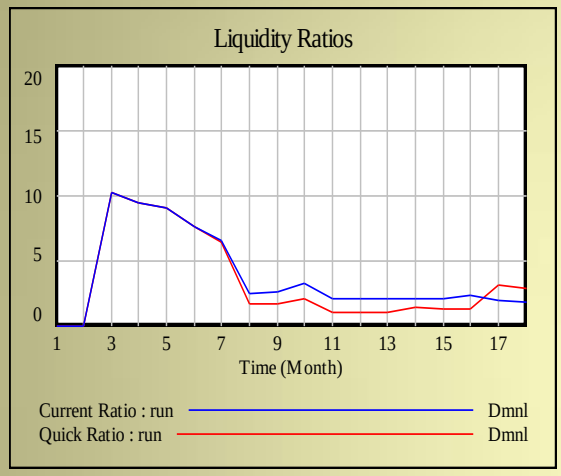
Profitability Ratios

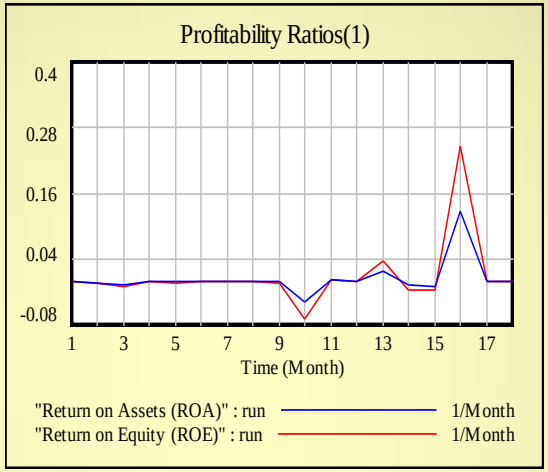


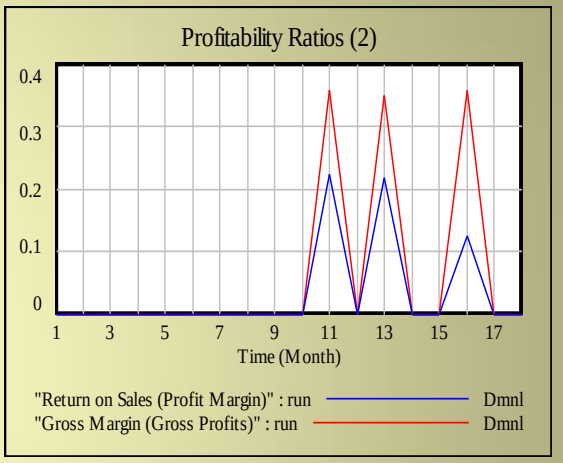
Leverage Ratios

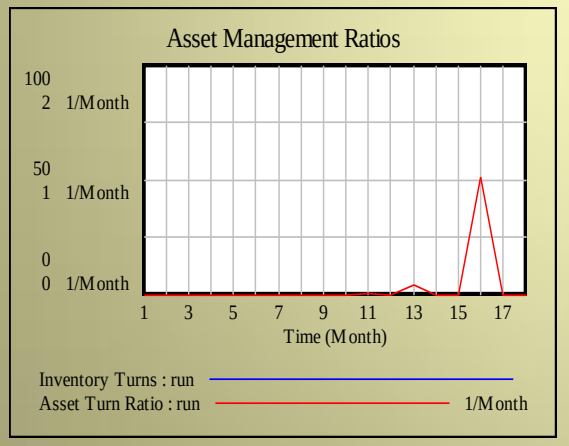


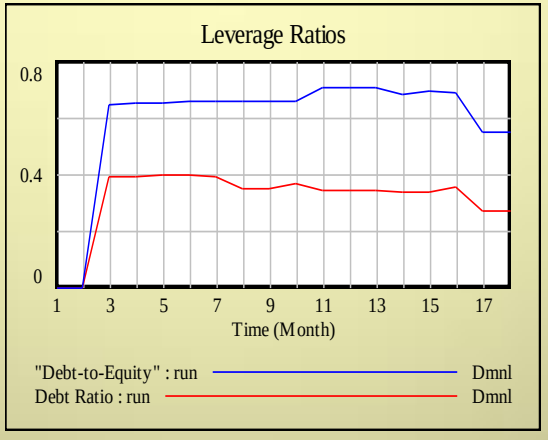
Ratio Analysis Simulations



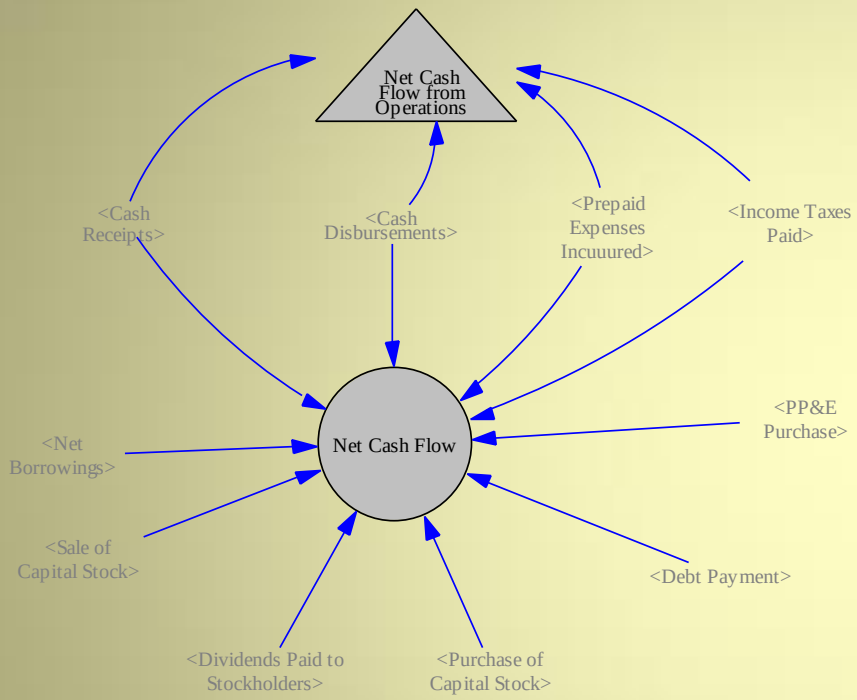


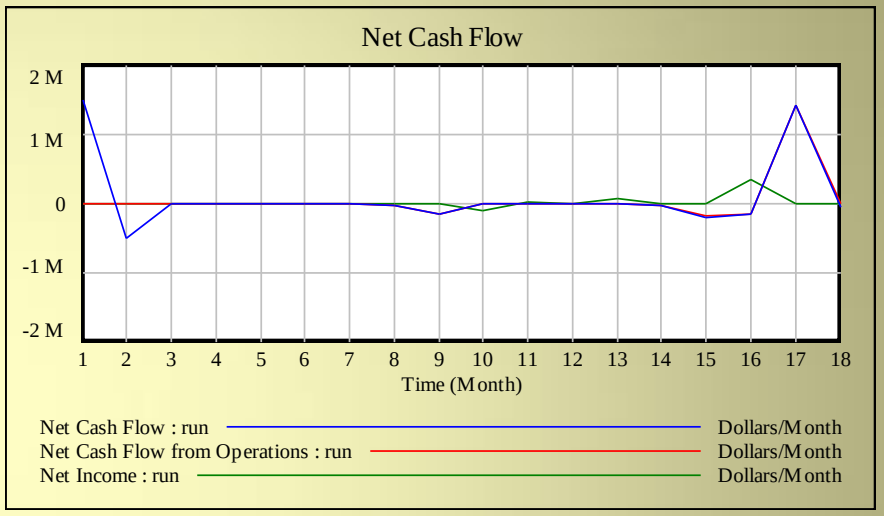


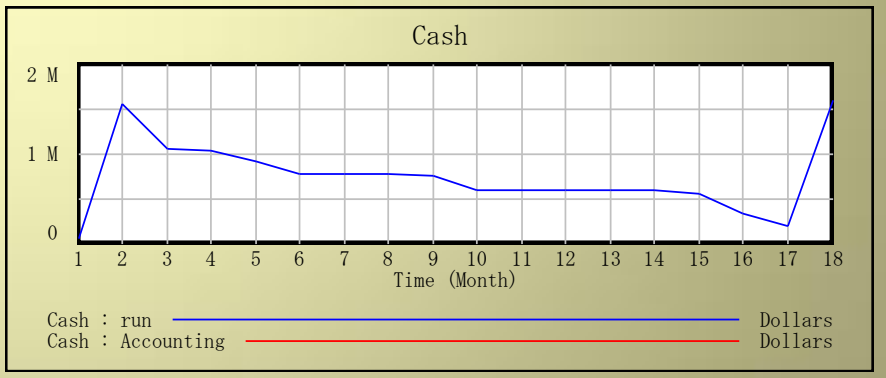




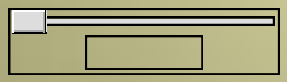
Cash Flow Analysis







Time Delay of Account Receivable



Time Delay of Account Payable