

# Money Supply and Inflation

## How and how much can the Money Supply affect the Inflation Rate?

### The Monetary View

Any increase in expenditure which cannot be met by an increase in output (or in imports) will result in a rise in prices, and the view that an increase in expenditure will lead to a change in price rather than quantity is, like the view that people want money only in order to spend it, a very long-established view in economics. It is part of what is usually referred to as the **quantity theory of money**.

The most common expression of this is in the equation of exchange:

$$M_s V = P T$$

Where:

- $M_s$  is the money stock;
- $V$  the **velocity of circulation** or the number of times the money stock changes hands per period of time;
- $P$  is the average price of goods and services;
- $T$  is the number of transactions per period of time.

It is customary to point out immediately that this is an identity or truism since  $M_s \times V$  (the total of spending) must be equal to  $P \times T$  (the total of receipts). In itself this is of no interest to us.

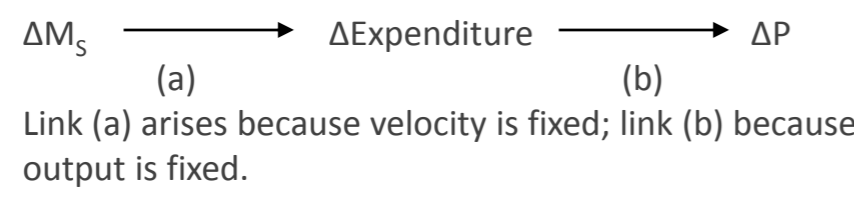
$V$  was regarded as fixed by custom or convention.

If, on the left-hand side of the equation,  $M_s$  increases, expenditure will rise because people's willingness to spend the money is fixed. On the right-hand side,  $T$ , the volume of transactions, will depend upon the **quantity** of goods and services bought and sold. This is taken to mean that it depends upon the quantity produced, though this assumes a constant relationship between total transactions and transactions involving newly produced goods and services. Thus, the transactions symbol ( $T$ ) is often replaced by output ( $Y$ ). This was traditionally treated as fixed because it was argued that the economy tended always to 'full employment' (though little thought was given to what was meant by the expression). The argument was that people would prefer to work rather than not work and that the force of competition for jobs would produce that level of real wage at which everyone could be profitably employed.

With  $V$  and  $T$  constant, a change in  $M_s$  will produce a proportional change in  $P$ . It can be seen that we have combined the following two propositions:

- A change in the money stock will always produce a proportional change in expenditure, i.e. velocity is fixed.
- A change in expenditure will lead to a change in the price level rather than in the quantity of output.

This produces the basic monetarist conviction that a change in the money stock has its influence mainly upon the price level. Schematically, we have:



### Is the above statement true? Is the Iceland's Inflation related to its Money Supply?

#### Regression Analysis

The **R square** is the coefficient of determination, the value of R lies between 0 and 1, the closer the value of R is to 1 the better the fit of the data to the model. The data taken in analysis show a medium-high value of correspondence between the **Δ Money Supply** and the **Inflation**: 0.67955956, the value is not very close to 1, 67.96% of the variation in the dependent variable can be explained by the variation in the Δ Money Supply.

The function should then be:

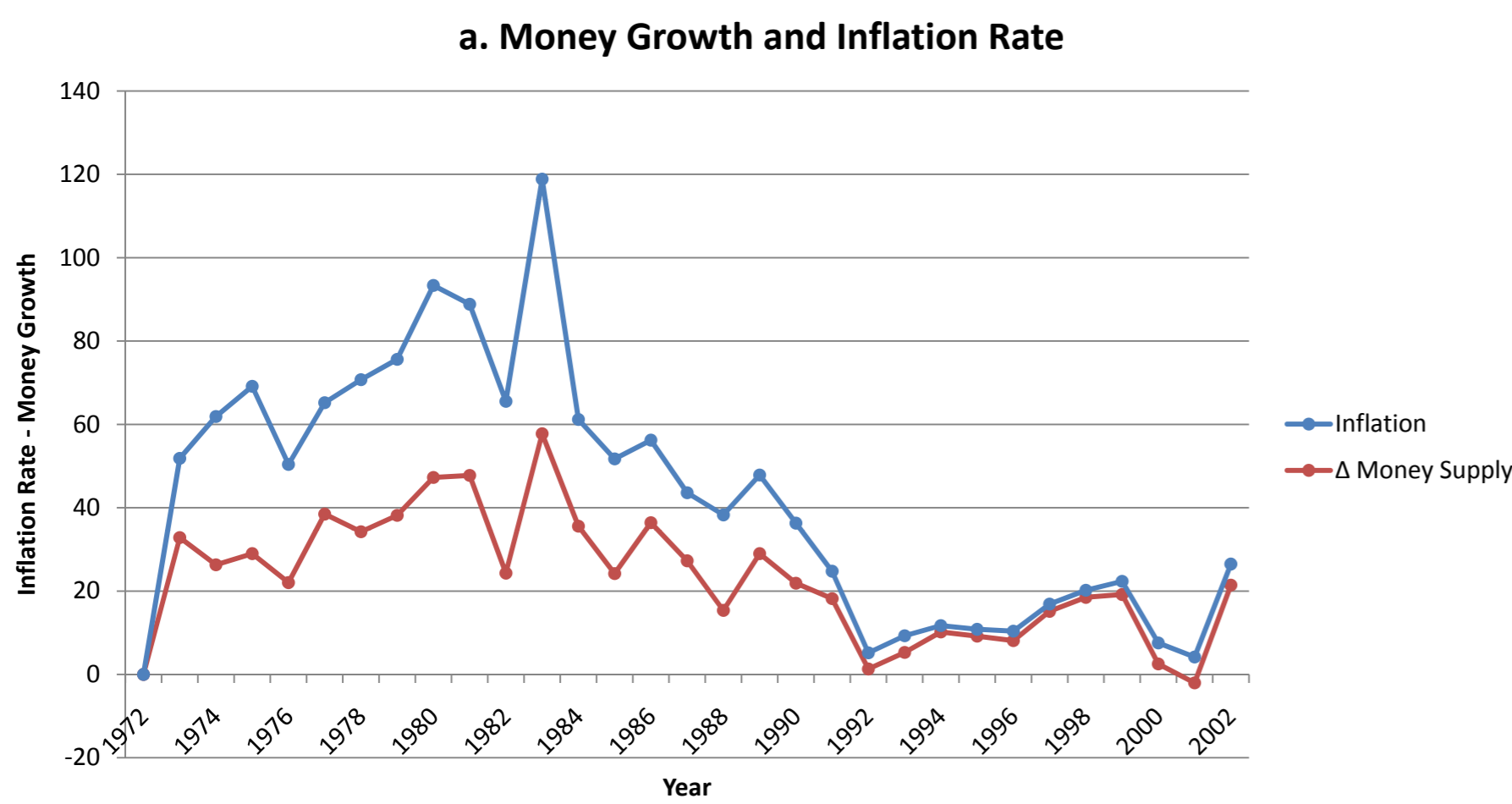
$$\text{Inflation} = \alpha + \beta \text{ms}$$

Given the information acquired from the data in analysis:

$$y = -2.45543673523044 + 0.944629907192597\text{ms}$$

- the estimated value for the intercept ( $\alpha$ ) is -2.45543673523044
- the estimated value for the slope coefficient or variable x coefficient ( $\beta$ ) is 0.944629907192597
- ms is given by the **Δ Money Supply** that change year by year

If we have a look to the graph, it shows year by year the correspondence between ΔMoney Supply and Price Level in the thirty years taken in analysis.



To accept the results we should first reject the *Null Hypothesis*, in that case for the transitive property the *Alternative Hypothesis* will be valid:

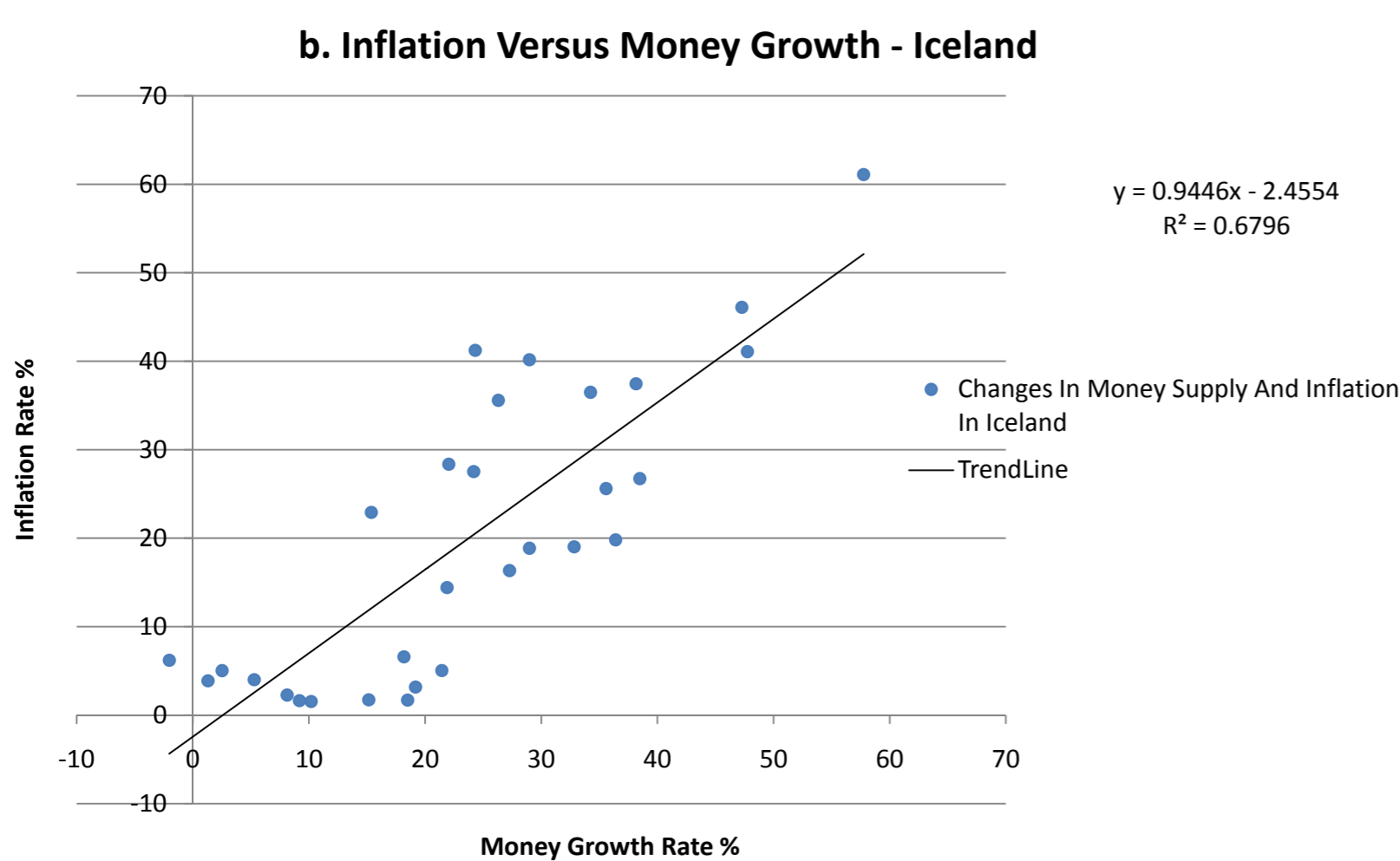
- *Null Hypothesis*  $H_0 : \beta = 0$
- *Alternative Hypothesis*  $H_1 : \beta \neq 0$

The *Null Hypothesis* has to be rejected in accord with two different values, the **t Stat** and the **P-value**:

- The **P-value** has to be lower than 0.025, P-value = 2.14901510258377E-08
- **t Stat** has to be higher than 2.048,  $t_{0.025}$  value = 7.70582459

The t Stat is much higher than 2.048 and the *Null Hypothesis* can be rejected according with the t Stat value. The P-value is lower than 0.025 and *Null Hypothesis* can be rejected according with the P-value.

The *Null Hypothesis* has been rejected either in accord with the P-value and t Stat, this means that  $\beta \neq 0$  implying that **exists a relationship between Money Supply And Inflation**.

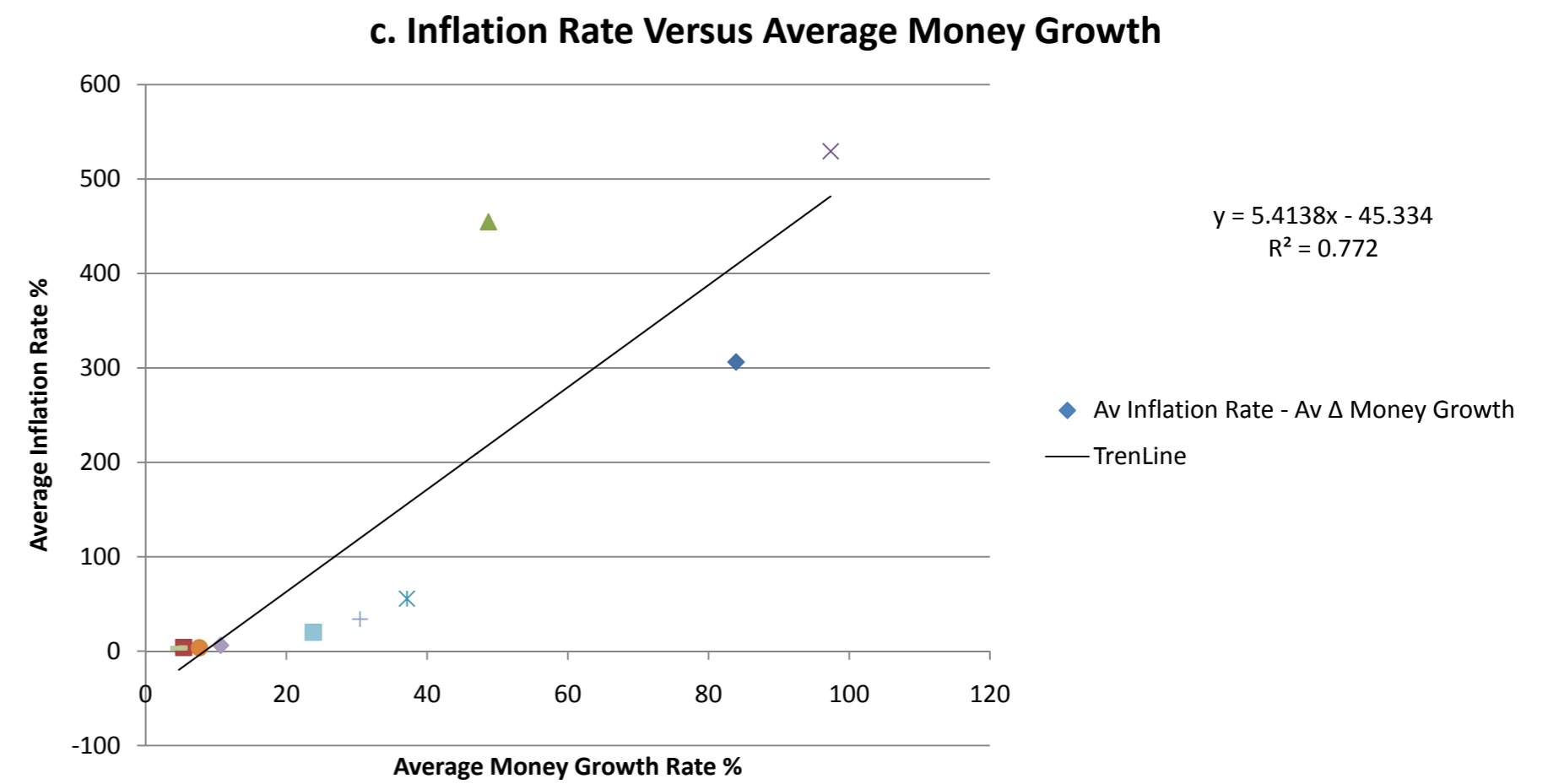


In this graph has been plotted the scatter diagram of the Δ Money Supply against the Inflation, the result has been a straight positive trend-line tending to the top-right with a low level of discrepancy, having a look to the math we can do further consideration.

### Will this statement be true if we extend it to a sample of ten countries?

Have been analyzed the Money Supply and the Inflation rate for a sample of ten different countries from 1972 to 2002: **Argentina, Austria, Bolivia, Brazil, Israel, Japan, Mexico, Switzerland, Netherlands and Thailand**. During the eighty's and the earlier ninety's have been the higher increases in both Money Supply and Inflation Rate all over the Latin America countries with abnormal-massive values experienced in Bolivia and Brazil, on the other hand the Money Growth rate seems to be slower and more stable for the Japan, Netherlands and Austria.

Inflation and Money Growth in general rise together. The data taken in analysis seem to indicate that once we have an increase in the Money Supply we are going to have an increase in the price level that we call inflation. Further evidence that inflation may be tied to continuing increases in the money supply is found in the graph below



For the eleven countries taken in analysis, they plot the average inflation rate (the rate of change of the price level, measured as a percentage change per year) over the thirty year period 1973 – 2002 against the average rate of money growth over the same period. As we can see, there is a positive association between inflation and the growth rate of the money supply: The countries with the highest inflation rates are also the ones with the highest money growth rates. Brazil, Bolivia, Argentina and Israel, for example, experienced high inflation during this period and their rates of money growth were high. By contrast, Austria, Japan, Thailand, Switzerland and Netherlands had low inflation rates over the same period, and their rates of money growth have been low. Iceland and Mexico experienced a high average inflation overall, but only a medium average inflation rate compared with the countries in analysis.

#### “Inflation is always and everywhere a monetary phenomenon”

Milton Friedman

Brazil, Bolivia, Argentina and Israel in the 1980s and 1990s experienced rapid inflation in which the high rates of money growth can be also classified as exogenous events. In particular, of all Latin American countries in the decades from 1980 to 1990, Brazil, Bolivia and Argentina had both the highest rates of money growth and the highest average inflation rates. However, in recent years, inflation in these countries has been brought down considerably. The explanation for the high rates of money growth in these countries could be the unwillingness of Brazil, Bolivia and Argentina to finance government expenditures by raising taxes led to a large budget deficits (sometimes over 15% Gross Domestic Product), which were financed by money creation. That the inflation rate is high in all cases in which the high rate of money growth can be classified as an exogenous event is strong evidence that high money growth causes high inflation. On the other hand Netherlands, Switzerland, Austria, Thailand and Japan experienced low inflation rate and low Money Growth; Japan in particular is still fighting the internal deflation which was caused by the profligate and irresponsible credit policies that led to their credit bubble.

Iceland and Mexico are in a medium position between them with an average Inflation and an average Money Growth respectively of 20.05% and 23.83%, and 33.93% and 30.45%.

#### Regression Analysis

The **R square** is the coefficient of determination, the value of R lies between 0 and 1, the closer the value of R is to 1 the better the fit of the data to the model. The data taken in analysis show a medium-high value of correspondence between the **Average Δ Money Supply** and the **Inflation**: 0.772037401477462, the value is not very close to 1, 77.20% of the variation in the dependent variable can be explained by the variation in the Average Δ Money Supply for the ten countries and the Iceland.

Given the information acquired from the data in analysis:

$$y = -45.3343903901449 + 5.41377836313203\text{ms}$$

- the estimated value for the intercept ( $\alpha$ ) is -45.3343903901449
- the estimated value for the slope coefficient or variable x coefficient ( $\beta$ ) is 5.41377836313203
- ms is given by the **Average Δ Money Supply** that change country by country

To accept the results we should first reject the *Null Hypothesis*, in that case for the transitive property the *Alternative Hypothesis* will be valid:

- *Null Hypothesis*  $H_0 : \beta = 0$
- *Alternative Hypothesis*  $H_1 : \beta \neq 0$

The *Null Hypothesis* has to be rejected in accord with two different values, the **t Stat** and the **P-value**:

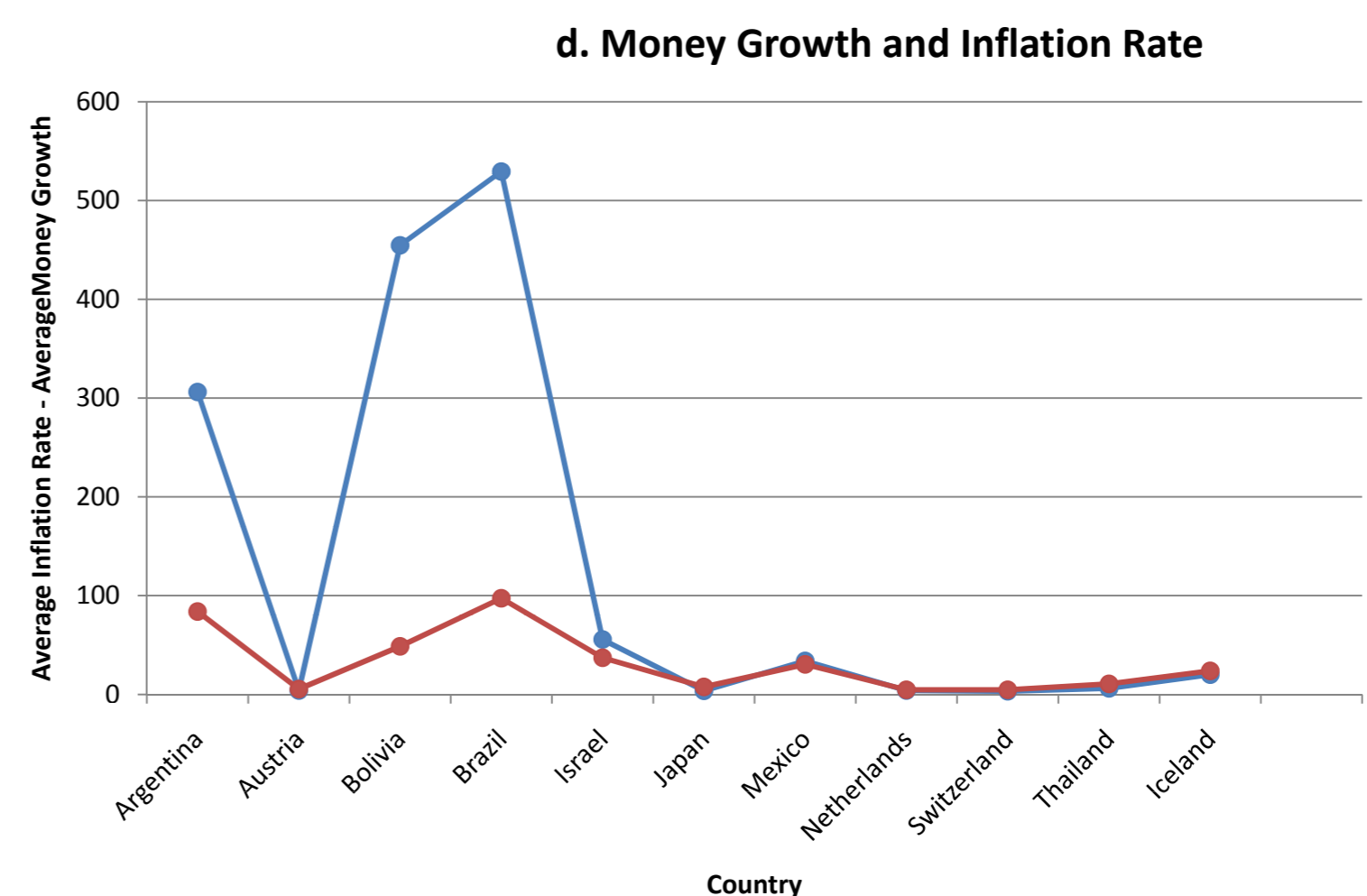
- The **P-value** has to be lower than 0.025, P-value = 0.000370060995343545
- **t Stat** has to be higher than 2.262,  $t_{0.025}$  value = 5.52088404134414

The t Stat is higher than 2.262 and the *Null Hypothesis* can be rejected according with the t Stat value. The P-value is lower than 0.025 and *Null Hypothesis* can be rejected according with the P-value.

The *Null Hypothesis* has been rejected either in accord with the P-value and t Stat, this means that  $\beta \neq 0$  implying that **exists a relationship between Average Money Supply And Average Inflation**.

#### Conclusion and Results

The regression analysis of the single country and the regression analysis of the sample of ten countries and the Iceland have been positive, both demonstrate that exist a **mathematical** relation between Δ Money Supply and Inflation. In the graph b has been shown (scatter diagram) the linear function between the Δ Money Supply and the Inflation for the Iceland, later on in the graph c has been shown (scatter diagram) the linear function between the average value of the Δ Money Supply and the Inflation for the sample taken in exam, both the functions are positive and fit with the model. Finally if we have a look to the graphs a and d we have got once again the graphic demonstration that if the money supply goes up the inflation goes up, if the money supply goes down, the inflation droops with it. Thanks to the different analysis done on these data and the different views which these data have been taken in analysis we can state that **country with high money growth tend to have high inflation, and countries with low money growth tend to have low inflation**.



If we have a look to the graph d, it shows country by country the correspondence between Average ΔMoney Supply and Price Level in the sample taken in analysis plus the Iceland.