Describe the matching function and its implications

Principles of Macroeconomics (ECO-2A05)

JASON PARR-MORLEY*

With the development of the theory starting in 1970, the matching function is used as a tool to help model the inefficiencies that are seen in many markets where two agents seek out each other in order to come to an agreement. This inefficiency is often referred to as "search friction". A substantial volume of research has now been undertaken on the topic to date, leading to the most prominent matching function theorists (Diamond, Mortensen and Pissarides) being awarded the 2010 Nobel Prize for Economics. Whilst their research predominantly focusses on the labour market, matching function theory has also been applied to other topics researched by both those aforementioned and other economists.

The greatest success and research with regards to the matching function is through attempting to resolve the issue of unemployment and unfilled vacancies in the labour market. The labour market never 'clears' and as such there are always jobs available, and always companies looking to hire. This creates inefficiency and the Diamond, Mortensen and Pissarides (DMP) model founded on search and matching frictions is the most prominent macroeconomic tool to effectively show the relationship between the rate at which the unemployed are hired with the number of people looking for jobs, and the volume of vacancies available. With the DMP model we see how steady state equilibrium in the market can be defined by three core equations focussed around labour market flows, job vacancy creation, and wage effects.

Using the matching function $h = m(u, v)$ [1,2] the first equation can be formed which shows how labour market flows can be calculated through the steady state unemployment rate model given as:

*2nd Year BSc Economics Student

[1] h is hires, u unemployment and v vacancies
[2] The matching function is presumed to be non-negative continuous and that it has constant returns to scale.

$$u = \frac{\phi}{\phi + \alpha(\theta)} \quad ^{3} \qquad (1)$$

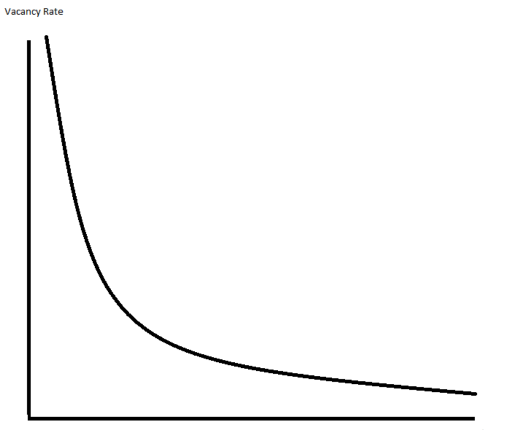

Figure 1

This shows the main influences upon the unemployment rate. The looser θ is, the higher the rate that vacancies are filled and lower the rate at which people exit unemployment, and vice versa. Furthermore θ's position in the equation means that the steady state model backs up the Beveridge Curve's (figure 1) relationship between unemployment and vacancies. The Beveridge curve shows that an increase in matching friction, causing both vacancy numbers and unemployment rates to increase would see an outwards shift in the curve[4]. The same effect can be seen through an increase in job destruction. Significantly however, other factors of the steady state model above would not see a shift in the Beveridge curve and instead there would be movement along the curve. This helps us to work out in a given environment what the factors are that determine the unemployment and vacancy rates. The obvious issue in the model is that it is difficult to measure u and v in real world situations, which in turn can significantly alter our beliefs regarding the current tightness of the labour market.

To add to the model around labour markets, and the implications and parameters of the matching function, we can adapt two core equations to determine θ and wages (w). These are:

$$y - w = \frac{(r+\phi)k}{q(\theta)} \quad ^{5} \qquad (2)$$

$$w = (1-\beta)b + \beta(y + k\theta) \quad ^{6} \qquad (3)$$

Presuming free-entry into the labour market, we can then use equation (2) to help us determine demand around vacancies in the labour market. The implication from equation (2) is that the tighter the labour market, the higher the costs to firms to recruit. The matching efficiency here influences vacancy creation, with higher efficiency resulting in firms more frequently finding available job seekers. With respect to wages in the labour market, it is presumed that wage is determined by

[3] θ is a measure of labour market tightness (v/u), Φ is the exogenous rate at which jobs are destroyed and α is the endogenously determined rate at which the unemployed enter employment
[4] Presuming θ remains constant
[5] r is discount rate, y is output per worker, k is the flow cost associated with vacancies, q(θ) is the vacancy fill rate of jobs.
[6] β is the measure of a workers relative bargaining power.

agreements between the job seeker and employer. Due to the matching frictions that occur however we are required to use the various factors of equation (3) to determine the wage rate. From this equation we can see that the main factors that influence the wage rate are labour productivity, market tightness and unemployment benefits. Together we can use equations (1), (2) and (3), to calculate the labour market steady state equilibrium. Furthermore we can use the equations to see how their various factors may influence the steady state equilibrium of the labour market. The matching function plays a key part in the equations, most notably in equations (1) and (2) where we see the matching functions influence through $\alpha(\theta)$ and $q(\theta)$ respectively. The implications of the matching function in these two equations are that if we increase matching function efficiency we will see a decrease in unemployment and an increase in real wages.

The matching function theory has also helped to improve models related to the business cycle. Before the concept of the matching function the unemployment rate was generally dismissed when in fact it is highly significant as it acts as a strong indicator of the business cycle. Following theory created by Pissarides (1985), it was realised that the original model, with a few adjustments, could be used to research unexpected shocks to the productivity of the labour force and as such show a cyclical link between vacancies and unemployment. Furthermore the model by Pissarides shows that due to the immediate ability to fire people, or make them redundant, compared to the longer process of trying to hire people, due to the matching function, we see unevenness between the effects of a positive and negative shock, which seems to in part explain fluctuations in the unemployment cycle, which can be linked to the business cycle.

It should also be noted that due to the mechanics of the matching function it can be adapted in ways that allow it to be theoretically applied to almost all markets with search frictions. Examples of topics where the matching function has already been applied to search theory include monetary theory, the housing market, public finance, financial economics and even the analysis of the marriage 'market'. Its application in these markets works because of its effectiveness at being able to calculate the level of frictions within the relevant market.

Overall, whilst the matching function can be applied to a number of different markets, its main application is within the labour market. Here, when used in various formulae it helps to show the effect of a large array of factors upon the labour market. This versatility has led to it being the most significant and important tool in effectively analysing the labour market particularly with regards to the macroeconomy. It is now frequently used by a variety of governments and think tanks when trying to decide upon unemployment policy, and macroeconomic policy as a whole. The simplified implication that can be taken from the matching function is that the lower the level of

search friction, the more efficient the relevant market is, and as such the lower the cost that is associated with the relevant markets pairings. This is most prominently shown in the *Diamond Paradox* (1971) which shows that due to matching frictions in a market the price of a good moves swiftly away from the traditional perfect competition model, towards a model which greater resembles a monopoly.

Bibliography

Blanchard, Olivier; Course materials for 14.462 Advanced Macroeconomics II, MIT OpenCourseWare (http://ocw.mit.edu/), Massachusetts Institute of Technology, Spring 2007. Downloaded on [23/05/2011]

Cheremukhin, Anton A, Restrepo-Echavarria, Paulina; The Labor Wedge as a Matching Friction, Research Department Working Paper 1004, Federal Reserve Bank of Dallas, June 2010.

Compiled by the Economic Sciences Prize Committee; Markets with Search Frictions, Scientific Background on the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel, October 2010.

Diamond, Peter 1971; A Model of Price Adjustment, Journal of Economic Theory 3, P156-168, June 1971

Fahr, Rene, Sunde, Uwe; Disaggregate Matching Functions. Institute for the Study of Labour Discussion Paper No.335, July 2001

Guerrieri, Veronica; Course materials for 14.461, Advanced Macroeconomics I, MIT OpenCourseWare (http://ocw.mit.edu/), Massachusetts Institute of Technology, Fall 2009. Downloaded on [23/05/2011]

Pissarides, Christopher; Short-Run Equilibrium Dynamics of Unemployment Vacancies, and Real Wages, American Economic Review, Vol 75 (4), P676-690, September 1985.

Shimer, Robert; The Cyclical Behavior of Equilibrium Unemployment and Vacancies, American Economic Review, Vol 95(1) p 25-49, March 2005

Stevens, Margaret; New Micro-foundations for the Aggregate Matching Function. International Economic Review, Vol.48 No. 3 p847-868, August 2007