

Chapter 5

How to Map the Brain

The purpose of this chapter is to discuss techniques that are being used to scan brain activity associated with financial decision-making, such as positron emission tomography (PET), single-photon emission computed tomography (SPECT), functional magnetic resonance imaging (fMRI) and electroencephalography (EEG).

5.1 Positron Emission Tomography and Single-Photon Emission Computed Tomography

PET is a technique that produces a 3D image of functional processes in the body by detecting gamma rays emitted indirectly by a positron-emitting molecule (tracer) that is injected into the blood stream. The most commonly used radiotracer in PET scanning is fluorodeoxyglucose, an analogue of glucose. The concentrations of tracer will indicate tissue metabolic activity by virtue of the regional glucose uptake. Limitations to the widespread use of PET arise from the high costs of cyclotrons needed to produce tracers and their short live. In addition, PET has to be obtained in combination with computed tomography (CT) scan that furnishes the image of the structure of the activated area.

SPECT measures gamma activity emitted by radioisotope, in general, attached to a specific ligand. SPECT imaging is performed by using a gamma camera to acquire multiple 2D images in multiple angles and a reconstruction computation is used to create a 3D image from the multiple data sets. The technique requires delivery of the