The question which multivariate GARCH models in the vec form are representable in the BEKK form is addressed. Using results from linear algebra, it is established that all vec models not representable in the simplest BEKK form contain matrices as parameters which map the vectorised positive semi-definite matrices into a strict subset of themselves. Moreover, a general result from linear algebra is presented implying that in dimension two the models are equivalent and in dimension three a simple analytically tractable example for a vec model having no BEKK representation is given.