The \((b, c)\)-inverse of products and lower triangular matrices

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Let \(S\) be a semigroup and \(b, c \in S\). The concept of \((b, c)\)-inverses was introduced by Drazin in 2012. It is well known that the Moore-Penrose inverse, the Drazin inverse, the Bott-Duffin inverse, the inverse along an element, the core inverse and dual core inverse are all special cases of the \((b, c)\)-inverse. In this paper, a new relationship between the \((b, c)\)-inverse and the Bott-Duffin \((e, f)\)-inverse is established. The relations between the \((b, c)\)-inverse of \(paq\) and certain classes of generalized inverses of \(pa\) and \(aq\), and the \((b', c')\)-inverse of \(a\) are characterized for some \(b', c' \in S\), where \(p, a, q \in S\). Necessary and sufficient conditions for the existence of the \((B, C)\)-inverse of a lower triangular matrix over an associative ring \(R\) are also given, and its expression is derived, where \(B, C\) are regular triangular matrices.